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TITLE: Health Status of Current National Guard Members

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Abstract

Two projects have been conducted under this funding award. The cross-sectional survey study (project #1) lays the ground work to better understand the impacts of ARNG jobs on health by examining current and former MA ARNG soldiers as they remain State-side; are deployed for combat, peacekeeping, or civilian emergency duties; and after they leave the military. The objectives are to: 1) describe the current health status of this ARNG cohort, 2) examine to what extent the job strain of ARNG service affects the relationship between civilian job strain and health and job performance outcomes and, 3) examine whether retention in the ARNG is related to current health status. A prospective deployment health field study (project #2), involving a MA ARNG group that deployed to Bosnia in 2001 and a comparison group (non-deployed), has been carried out to examine cognitive readiness and potential changes in health related to deployment. Data collection and all primary data analyses for the two research projects are complete; manuscripts have been prepared. These research projects represent some of the first to focus on the role that one's ARNG job plays on health status and quality of life.

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INTRODUCTION

Recently, epidemiological studies have demonstrated increased health symptomatology and lower functional status in troops returning from Gulf War (GW) in 1990-91 compared to other GW-era veterans (e.g., non-deployed personnel (Iowa Persian Gulf Study Group or Iowa et al., 1997; Haley et al., 1997; Fukuda et al., 1998; Unwin et al., 1999) or troops deployed to Germany during the same time period (Proctor et al., 1998; Proctor et al., 2001)). However, lack of information about GW veterans' pre-deployment health status has made it difficult to fully evaluate the role that deployment experiences play in soldiers' health (PRD5, 1998, p. 34). Two projects are being conducted under this funding award. The cross-sectional survey study (project #1) addresses three research objectives and lays the ground work to establish a cohort of current Massachusetts Army National Guard (MA ARNG) members whose health status can be followed longitudinally as they remain State-side; are deployed for combat, peacekeeping, or civilian emergency duties; and after they leave the military. The primary objective is to describe the current health status of this National Guard cohort using methods that will permit comparison to other population norms (e.g., Medical Outcomes Study Short Form Health Survey, SF36 (Ware 1993, 1994); SF36V (Kazis et al., 2000)) and current surveillance system parameters (e.g., US Army Health Risk Appraisal). The second objective is to examine to what extent the job strain (Karasek 1979; Karasek and Theorell, 1990) of National Guard service as a 'second job' affects the relationship between the job strain of the service members' civilian jobs and health and job performance outcomes (functional health status, fatigue symptomatology, job performance). The third objective is to examine whether retention in the National Guard is related to current health status by additionally surveying a cohort of persons who have left National Guard service within the past 3-4 years. The study cohort includes all current Massachusetts (MA) ARNG members and former members who have left ARNG service within the past three years (as of October 2000). Each participant was asked to complete a mail survey about his/her current health and deployment and occupational characteristics (both civilian and military). A prospective deployment health field study (project #2) involving a MA ARNG group deploying to Bosnia in 2001 and a comparison group (non-deployed) is being carried out to examine changes in cognitive readiness and functional health related to deployment. These two research studies are some of the first to focus exclusively on the role that one's Army National Guard job plays on health status and quality of life. Identification of specific occupational factors that relate either negatively or positively to health status is an important step towards designing and implementing effective strategies that will protect and improve the health of National Guard members in the current military environment (cf. PDR5, 1998; CDC Conference- Prevention Working Group Recommendations, 1999). Recent efforts in the area of deployment health and force health protection appear largely focused in the Active duty arena. As has been identified by the Institute of Medicine (2000), there is a need to focus research efforts on National Guard and Reserve forces in order to learn more about their specific issues and concerns in the current military climate.

BODY

Two projects have been conducted under this funding award. The survey study (project #1) was initiated in January 2000 and the deployment health field study (project #2) was initiated in June 2001.

To follow is the Final Report for both of the projects funded under this award. The funding award was extended over the past year (on a no-cost extension), so the approved end date for these projects is July 23, 2005.

FINAL REPORT- PROJECT #1

Health Status of Current National Guard Members: Role of Civilian and Military Jobs

Approved SOW tasks for Year 1-4 funding periods & no-cost extension (23 Jan 2000- 23 July 2005).
See NOTES section below for further description re: revised SOW rationale and timelines.

Year 1	Jan '00	
Task 1	Months 1-3	Hiring of project staff; Organize Advisory Group
Task 2	Months 4-10	Finalize the survey instrument, via:
Task 2a		Telephone and in-person interviews with current ARNG members
Task 2b		Conducting structured telephone interviews with ARNG members
Task 2c		Pilot the survey instrument on group of 20 volunteers.
Task 2d		Convene a meeting of the Advisory Group to finalize survey instrument
Task 3	Months 11& 12	Request updated list of current ARNG members from DMDC
Task 4	Months 11& 12	Determine number of persons who have left ARNG in past 3 years
Task 5	Months 11& 12	Pre-notification of study, at the unit level throughout MA
Task 6	Months 11& 12	Printing of final survey instrument and mailing materials
Year 2	**Jan '01 (*NOTE #1)**	
Task 1	Months 1	First wave mailing to current ARNG members and group who have left
Task 2	Months 2 & 3	Three follow-up reminders, including one re-mailing of survey
Task 3	Months 1-4	Set up of data entry procedures
Task 4	Months 1-6	Data entry completed
Task 5	Months 6	Convene Advisory Group to discuss response rates and analytic plans
Task 6	Months 6-10	Data checking and cleaning completed
Task 7	Months 9 & 10	Initiate and carry out linkage to HRA database
Task 8	Months 11& 12	Preliminary data analyses and descriptive analyses
Year 3	**Jan '02**	
Task 1	Months 1-6	Re-initiation of survey plan (same format as proposed for year 2), but under new administrative procedures and with human subjects modification to include subject reimbursement plan.(****NOTE #2**)
Task 2	Months 1-12	Carry out analytic plans to test study hypotheses.
Task 3	Months 7-9	Telephone interviews with subsample of survey non-responders (*****NOTE #3**)
Task 4	Months 10-12	Analysis of telephone interview responses.
Task 5	Month 12	Convene Advisory Group to discuss results and manuscript preparation
Year 4	**Jan '03 (***NOTE #4)**	
Task 1		Telephone interviews with subset of survey non-responders
Task 2		Analysis of telephone interview responses.
Task 3		Carry out analytic plans to test study hypotheses.
Task 4		Manuscript preparation for publication submissions.
Task 5		Write final study report.

*NOTE #1: When the additional project (#2, see below) was proposed and funded in June 2001, the funding award period was extended to 3 ½ years.

**NOTE #2: The survey-mailing schema was initiated in Year 2 but not completed as scheduled in our original timeline as we requested to make some administrative procedural changes and needed to obtain IRB approval to include subject reimbursements. The BU IRB and Army Human Subjects Research Review Board (HSRRB) approved these changes December, 2001. The survey plan was re-initiated in early Year 3.

***NOTE #3: A request for supplemental funds was made and received in June 2002 to include telephone interviews with a subset of survey non-responders (revised SOW approved) and the project timetable for both project # 1 (and #2) was extended so that the end date for these projects is January 23, 2004.
****NOTE #4: A ~10 month delay in the initiation of the telephone interview phase with survey non-respondents (due to IRB-related issues and approvals) and thus the completion of subsequent data analyses has required an extension to the award period. A request for a no-cost extension for this funding award was made and approved and thus the approved end date for this funding award is July 23, 2005.

SUMMARY OVERVIEW OF PROJECT STATUS

The survey study was initiated in January 2000 and therefore progress reports for each year of the funding award were provided with each of the previous Annual Reports. In this Final Report we summarize the work conducted over the entire research period, including work conducted (**TABLE 1**) since the last Annual Report (March 2004).

The Final Report for Project #1 is organized into four sections: Data Collection Summary and Methodological Issues, Hypotheses Examined, Results, and Lessons Learned.

TABLE 1. Summary Status of Final Set of Project Tasks

Task 1 Telephone interviews with subset of survey non-responders **[STATUS: COMPLETED]** *Task 2* Analysis of telephone interview responses. **[STATUS: COMPLETED]** *Task 3* Carry out analytic plans to test study hypotheses. **[STATUS: COMPLETED]** *Task 4* Manuscript preparation for publication submission. **[STATUS: COMPLETED MANUSCRIPT DRAFT PREPARATION]** *Task 5* Write final study report. **[STATUS: COMPLETED, with the submission of this Report]**

A. Data Collection Summary and Methodological Issues

Over the entire mailing and survey collection period (between April 2001 and September 2002) a total of 1,970 completed surveys were returned. The response rate was approximately 18% of those persons we assume received the mail survey. However, as we learned in our subsequent investigations (see A. 2 below), we are unsure if all the mailed surveys actually were received.

Although we have sufficient power to test the study hypotheses with the current respondent sample size, we are aware that differences between the survey respondents and non-respondents may affect the validity and generalizability of the survey study results to the larger MA ARNG population. So, we have taken additional steps to examine the reasons for the lower response rate and the generalizability of results from the survey responders.

As described in earlier Annual Reports and summarized below, we compared non-responders to responders in terms of general demographic and descriptive information obtained through the Defense Manpower Data Center (DMDC) to identify potential differences (AR 2003). Also, we conducted telephone interviews with a subset of the non-responders (AR 2004) to better understand if there were differences in health and occupationally related factors between the survey responders and non-responders that would affect the generalizability of the results.

1. Assessment of potential non-response bias and generalizability

Recent review of the literature (and personal communications with other survey study PIs) concerning mail survey response rates within current military personnel suggests that survey response rates are decreasing (US General Accounting Office, 2001), with response rates in the 15-40% range being observed (Schumm et al., 2000; Ryan, 2003 personal communication). [NOTE: Dr. Ryan is the PI of the Millennium Cohort Study (Chesbrough et al., 2002), a prospective survey study designed to follow a cohort of 140,000 military personnel over a 21-year period with re-surveying planned every 3 years over this time frame.] With the current deployment rotation schedules, participation rates may decline further due to difficulties in locating and contacting military personnel.

1. a. Comparison of demographic and descriptive information. Descriptive information about the larger group of current and former National Guard members from the DoD DMDC was obtained at the study outset in order to identify our cohort. From these data, we find that the responders are significantly older (with the mean age=40.3 (SD=11.8) for responders and mean age=33.5 (SD=10.0) for non-responders). Also, responders are more likely to be officers and female (**TABLE 2**). After adjusting for age, comparisons between survey responders and those not responding indicate no significant differences in years since entry into the service, race/ethnicity, education, or whether they ever served on Active Duty or been deployed overseas (although differences on race/ethnicity and marital status approach statistical significance). Also, no striking differences between occupational codes were noted between the responders and non-responders, except that those belonging in the Non-occupational category (students, trainees (boot campers), officer candidates) were less likely to respond.

Similar descriptive differences between respondents and non-respondents have also been observed in other recent mail survey studies involving military personnel, such as the mail survey study conducted by Schumm and colleagues (2000) and recent analyses of the respondent characteristics of the 2001 cohort enrollment efforts in the Millennium Cohort Study (Ryan, 2003 presentation of current project status).

TABLE 2.	NON-RESPONDERS	RESPONDERS		
	n=8,884 (does not include those whose mail was undeliverable, does include refusers & deceased)	n=1958 (does not include 12 anonymous responders)		
	FREQUENCY (%)	FREQUENCY (%)	Age-ADJ. OR	95% CI
Gender			1.7	1.4, 1.9
Male	7933 (89.3)	1718 (87.7)		
Female	951 (10.7)	240 (12.3)		
Race/Ethnicity			0.85	0.72, 1.0
White	7753 (87.3)	1756 (89.7)		
Other	1131 (12.7)	202 (10.3)		
High School Education			1.2	0.96, 1.5
No	881 (9.9)	91 (4.6)		
Yes	8000 (90.0)	1867 (95.4)		
Marital Status			1.1	1.0, 1.3
Not Married	5682 (64.0)	868 (44.3)		
Married	3202 (36.0)	1090 (55.7)		
Ever Served on Active Duty			0.98	0.88, 1.1
No	6595 (74.2)	1374 (70.2)		
Yes	2289 (25.8)	584 (29.8)		

TABLE 2 continued.	NON-RESPONDERS	RESPONDERS		
	n=8,884 (does not include those whose mail was undeliverable, does include refusers & deceased)	n=1958 (does not include 12 anonymous responders)		
	FREQUENCY (%)	FREQUENCY (%)	Age-ADJ. OR	95% CI
Ever Deployed Overseas			1.0	0.86, 1.2
No	7983 (89.9)	1746 (89.2)		
Yes	901 (10.1)	212 (10.8)		
Rank			**1.5**	**1.3, 1.7**
Enlisted	8186 (92.1)	1656 (84.6)		
Officer	698 (7.9)	302 (15.4)		
Occupational Area - Enlisted				
Infantry, Gun Crews, Seamanship	2100 (23.6)	441 (22.5)	1.1	0.95, 1.2
Electronic Equipment Repairers	182 (2.0)	49 (2.5)	1.2	0.85, 1.6
Communications and Intelligence Specialists	295 (3.3)	57 (2.9)	0.96	0.72, 1.3
Health Care Specialists	330 (3.7)	72 (3.7)	1.1	0.87, 1.5
Other Technical / Allied Specialists	239 (2.7)	65 (3.3)	1.2	0.90, 1.6
Functional Support / Administration	1030 (11.6)	290 (14.8)	1.1	0.92, 1.2
Electrical / Mechanical Equipment Repairers	899 (10.1)	197 (10.1)	**0.83**	**0.70, 0.99**
Craftworkers	368 (4.1)	92 (4.7)	1.22	0.96, 1.6
Service and Supply handlers	1162 (13.1)	228 (11.6)	0.93	0.79, 1.1
Non-Occupational	1581 (17.8)	165 (8.4)	0.83	0.69, 1.0
Occupational Area - Officer				
Not Defined	1 (0.0)	0 (0.0)	0.04	0.00, 3.99xE5
General Officers / Executives	2 (0.0)	0 (0.0)	0.02	0.00, 1.49xE3
Tactical Operations Officers	353 (4.0)	144 (7.4)	0.97	0.73, 1.3
Intelligence Officers	17 (0.2)	10 (0.5)	1.5	0.66, 3.3
Engineering / Maintenance Officers	69 (0.8)	35 (1.8)	1.1	0.69, 1.7
Scientists / Professionals	19 (0.2)	6 (0.3)	0.55	0.21, 1.4
Health Care Officers	45 (0.5)	35 (1.8)	**1.7**	**1.1, 2.7**
Administrators	66 (0.7)	30 (1.5)	0.92	0.58, 1.5
Supply, Procurement, Allied Officers	62 (0.7)	33 (1.7)	1.2	0.77, 1.9
Non-Occupational	58 (0.7)	7 (0.4)	**0.36**	**0.16, 0.81**

Bold signifies p < 0.05 as 95% confidence interval (95% CI) does not include 1.0.

1. b. Brief telephone interview with subset of survey non-responders. As DMDC-obtained variable fields did not include any information concerning health status and military/civilian job characteristics (other than occupational codes) that might impact the generalizability of the results obtained from testing the study hypotheses, we conducted a telephone interview (AR 2004) with a subset of non-responders to examine these factors. The subject pool from which the targeted subset was selected for the telephone interview included those subjects who we believe received the mail survey, but we are not sure (n=8,375). (See further discussion below.) This sample pool did not include those non-responding persons who we <u>know</u> never received the mail survey (i.e., the mailings came back as undeliverable upon repeat mailings to supposedly current addresses), those who indicated to us that they did not want to participate, and those who are deceased.

As part of the brief telephone interview with a subset of survey non-responders we also asked questions about whether or not they ever received the mailed survey (see section A 2. below).

A stratified, random sample of 500 persons were selected and invited to participate in the telephone interview. The subset was selected so that it was of similar proportion in terms of gender as the larger group from which it was sampled (~10%) and was oversampled for the younger age group so that 50% would be less than 35 years of age.   Due to post September 11 activation for homeland security and general heightened operational tempo (optempo), our goal was to interview ~50% of the selected subset. The Non-Responser (NR) telephone interview was carried out in the summer of 2003 by trained interview staff at John Snow Institute (JSI). A total of 230 persons participated in the NR telephone interview, representing a 56% (230/412) response rate with those persons who could be located. Approximately 25% of those persons located declined to participate in the NR telephone interview. Almost 7% of the targeted sample was deployed or mobilized at the time of the interview, so the response rate achieved with those persons who were both located and able to be contacted was about 62%.

As reported in the 2004 AR, there were no substantial differences in the health status and ARNG or civilian job characteristics between the NR telephone interview responders compared to our mail survey responders (TABLE 3), suggesting there is little or minimal response bias with our mail survey responders on functional health and occupational factors. Also, the NR telephone interview results suggest that even though our mail survey responders were older than the overall MA ARNG, the responses from the mail survey responders appear to be generalizable to the MA ARNG population.

TABLE 3.

	NR Telephone Interview Responders (n=230)	Mail Survey Responders (n=1,970)	
Age	36.6 (10.6) [range: 20-66]	39.6 (11.7) [range: 18-65]	p< 0.001, expected due to sampling design
			Age-adjusted, *p<.05
Education	14.2 (2.2)	14.1 (2.4)	
Physical Component Summary score (V/SF36)	53.1 (7.4)	52.8 (7.8)	
Mental Component Summary score (V/SF36)	54.4 (9.3)	53.2 (9.3)	*
Job Demands-NG job (Karasek scoring, 1985)	31.6 (5.4)	30.9 (5.9)	
Job Control- NG job (Karasek scoring, 1985)	64.6 (12.7)	66.3 (14.1)	
Job Demands- Civ. Job (Karasek scoring, 1985)	32.6 (6.0)	31.7 (5.9)	
Job Control-Civ. Job (Karasek scoring, 1985)	72.4 (12.9)	71.3 (13.5)	
# Hours worked/week- Civ. Job	45.4 (11.6)	43.1 (23.9)	
% Female	9.1%	13.1%	
% Non-White, Caucasian	16.6%	21.8%	
% Married	51.3%	61.1%	
% In MA ARNG in 2000	68.7%	68.8%	
% Current Officer	10.8%	18.7%	
% Retired Officer	9.9%	14.1%	
% Satisfied with NG job	79.4%	74.4%	
% Satisfied with Civ job	87.4%	83.9%	
% Have Civ. Job	83.5%	80.1%	
% Limits on Physical Activity	16.7%	14.0%	
% Current Smoker	21.7%	22.3%	
% Current Chewing Tobacco use	3.9%	4.2%	
% Health rating of fair or poor	5.2%	6.0%	
% Deployed (> 1 month overseas) with ARNG	34.3%	29.3%	

1. c. Other comparisons. The PI has initiated a dialog with Dr. Ryan of the Millennium Cohort Study to ascertain the potential for a collaborative effort to compare respondent characteristics between the ARNG soldiers completing the Millennium Cohort Study and those MA ARNG soldiers participating in this study to further address generalizability issues in areas where the survey contents overlap (namely, demographic characteristics, functional health (SF36V), and presumptive PTSD).

2. Assessment of mail survey process.
As part of the NR telephone interview, we asked a series of questions about receiving the mail survey. If participants answered 'yes' they did remember receiving it, they were asked for the reason why they did not participate (**TABLE 4**). Of the 31% that stated they never remembered receiving our mail survey, the reasons why can be explained by either a recent change of address, having been activated or deployed, or living in an apartment with centralized mail delivery.

TABLE 4. Question #1: Do you remember receiving the [mail] survey? 69% Yes (n=157) 31% No (n=72)

<div align="right">If No, then asked Q# 2-4.</div>

Question#2: Has your address changed since Spring 2002?   49% Yes (n=40)
Question #3: Have you recently been activated or deployed?   25% Yes (n=19)
Question #4: Do you live in an apartment or condo complex with central mail delivery? 13% Yes (n=10)
Question #5 (asked of all): Is there a reason why you did not participate in the original mail survey?

<div align="center">Top 5 reasons given: 30% never received survey in the mail
17% were too busy and had no time to complete it
7% had done it and said mailed it back to us
5% didn't think it applied to them as no longer in the NG</div>

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3. Data management summary.
We created a master database with all the mail survey response data that was linked to available HRA data. A total of 89% of the survey responders provided specific consent for us to access their recent HRA data. As HRA data is only collected every 3- 5 years and routinely is not kept for those Soldiers < 38 years of age, we obtained available HRA data, primarily through collaboration with the MA ARNG, for 462/1738 of the survey responders. Through a separate request to COL Rubertone (AMSA, CHPPM), we obtained HRA data for an additional 109 persons, for a total of 570 (or 29% of the survey responders).

4. Survey scale characteristics and internal consistency estimates.
Estimates of internal consistency reliabilities for selected survey scales are presented in **TABLE 5**. As shown, estimates were quite good, with 13 out of 21 of the reliabilities 0.85 or higher and 18 out of 21 greater than 0.80.

TABLE 5.

		N	# items in scale	Alpha
SF36V Subscales	Ware, 1993, 1994; Kazis 2000			
Physical Functioning		1,958	10	0.93
Role-Physical		1,950	4	0.94
Bodily Pain		1,951	2	0.91
General Health		1,967	5	0.82
Vitality		1,955	4	0.83
Social Functioning		1,957	2'	0.85
Role-Emotional		1,949	3	0.91
Mental Health		1,956	5	0.83
Cognitive Functioning Scale	Beurskens et al., 2000	1,943	4	0.90
CIS Fatigue		1,805	20	0.92

		N	# items in scale	Alpha
JCQ	Karasek, 1985			
NG job- Decision Latitude		1,845	9	0.86
NG job- Job Demands		1,853	5	0.63
Civ. job- Decision Latitude		1,565#	9	0.87
Civ. job- Job Demands		1,541#	5	0.66
BSI-18	Derogatis, 2000	1,882	18	0.92
Somatization		1,908	6	0.76
Depression		1,906	6	0.90
Anxiety		1,906	6	0.83
PTSD Checklist	Weathers et al., 1993; Blanchard et al., 1996	1,867	17	0.94
Family Support of Work Inventory	Adapted from King et al., 1995			
NG job		1,446 #	10	0.86
Civ. job		1,228 #	10	0.88

sample sizes are lower, as not everyone had a civilian job and/or family group

5. Analyses of respondent characteristics and responses between those who completed the survey pre- and post-September 11, 2001.

Because of the potential for changes in MA ARNG soldiers' working lives post-September 11, 2001, we examined whether there were differences between mail survey responders pre-September 11 and post-September 11 (similar to a study by Smith et al. 2004 based on Millennium Cohort Study data). A total of 611 persons responded before September 11 and 1,359 responded to the mail survey after September 11, 2001. No major differences between the responder groups were noted. Overall, those persons responding pre-September 11 did report significantly higher levels of civilian and ARNG job decision latitude (that is, more job control) compared to those responding post-September 11. However, these differences were not present when restricted to those currently in the MA ARNG.

6. Military Occupational Specialty codes.

Part of this project includes constructing a two-dimensional demand/control matrix depicting the distribution of high and low strain and active and passive jobs based on ARNG military occupation specialties, in a manner similar to the JCQ occupational score standardization system (Karasek and Theorell, 1990) and the occupational linkage system (Schwartz et al., 1988).

For this, a four-quadrant matrix distribution display of different jobs according to whether they are classified as high or low strain jobs and active or passive jobs, with axes split at the median (**Figure 1A & B**) has been constructed. For example, in a civilian setting, the *active job* quadrant (upper right) may include jobs with high demands and high control, such as public officials, physicians, and engineers; the *high strain* quadrant (lower right) includes jobs with high demands and low control, such as assembly line workers, waiters, and freight handlers. We are not aware that a similar standardization of JCQ scores exists for military occupation codes overall nor for National Guard service jobs specifically. Such a system may prove useful as a categorization scheme of higher or lower ARNG job strain that may, in turn, influence job performance and health. Also, development of a MOS linkage system that permits military job content scores to be linked with other military health surveillance databases for the purposes of epidemiological research would prove informative. **Figure 1C** displays in the ARNG job strain matrix with the 19 most prevalent MOS categories within the mail survey responders who were currently serving in the MA ARNG as enlisted soldiers. The four MA ARNG MOSs depicted in the high job strain quadrant are 11B (infantry), 12B (combat engineer), 88M (truck driver), and 91B (medical specialist).
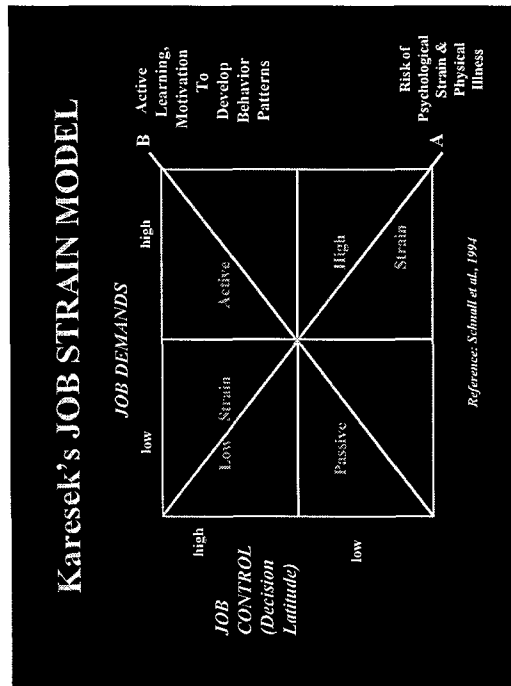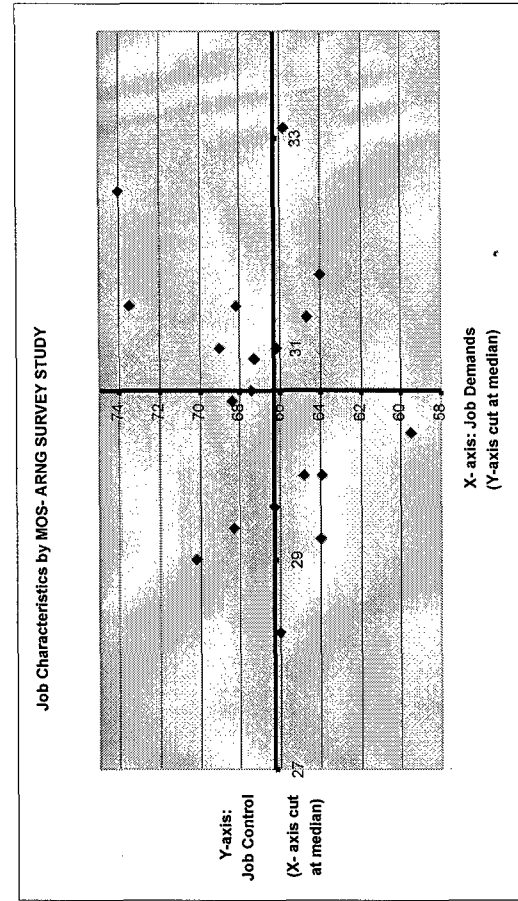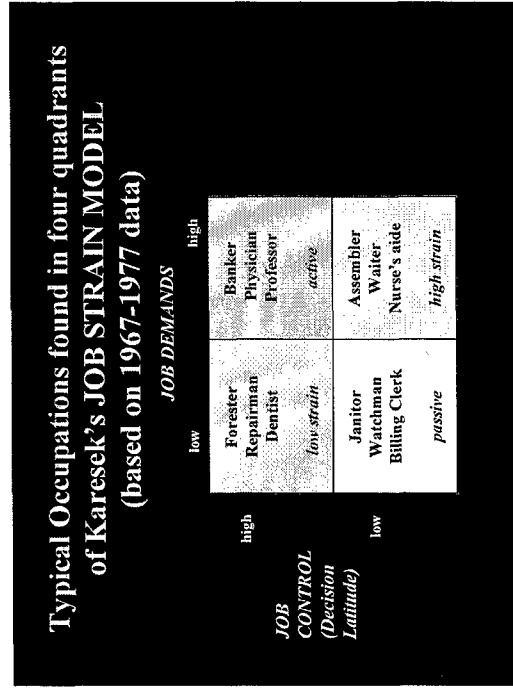
Figures 1A-C.

Figure 1B

Karesek's JOB STRAIN MODEL

Reference: Schnall et al., 1994

Typical Occupations found in four quadrants of Karesek's JOB STRAIN MODEL (based on 1967-1977 data)

Job Characteristics by MOS- ARNG SURVEY STUDY

Y-axis:
Job Control
(X- axis cut at median)

X- axis: Job Demands
(Y-axis cut at median)

B. Hypotheses Examined

✓ *Hypothesis #1*: Overall, the functional health status of current ARNG members will be similar to or better than other US healthy population norms, adjusted or stratified by age and gender.

✓ *Hypothesis #2*: The Physical Functioning and Role-Physical subscales and the Physical Component Summary (PCS) from the SF36 will be significantly correlated to the health risk appraisal parameter, assessed within the past five years as part of the HRA, adjusted or stratified by age, gender and prior deployment.

✓ *Hypothesis #3*: Higher job strain of one's military and civilian job is related to lower functional status and increased fatigue symptomatology.

✓ *Hypothesis #4*: National Guard job strain characteristics (high job demands, low decision latitude or control) along with job insecurity, lower coworker and supervisor support, and a hazardous work environment will predict poorer military job performance.

✓ *Hypothesis #5*: National Guard job strain will confound or modify the relationship between the effect of civilian job strain and adverse functional health status.

✓ *Hypothesis #6*: Job strain of one's civilian and National Guard job will be highly correlated with increased frequency of occupational stress (as recorded on the HRA within the past five years). And, it is predicted that NG job strain will be more highly correlated with the HRA response than civilian job strain.

✓ *Hypothesis #7*: Those ARNG members who have left the service within the past three years will have significantly lower functional health status compared to current members.

✓ *Hypothesis #8*: Those persons in high strain NG jobs would be more likely to leave the ARNG.

C. Results

Below is a summary of results based on analyses of the Study Hypotheses; some of this information has been reported in previous ARs.

TABLE 6 below **(column 2)** presents the descriptive characteristics for all survey responders. As might be expected, the group of former ARNG members is significantly older than the current members group. This observation is most likely related to the fact that former members have reached an age and/or cut-off number of years of service in order to retire from the ARNG. The group of former members is also less likely to have been an officer or deployed previously compared to current ARNG members. There are no significant differences in education level, gender, race/ethnicity, and marital status between the current and former ARNG members completing the survey.

TABLE 6. Descriptive characteristics of current and former MA ARNG members who returned survey.

	All Subjects (n=1970)	Current ARNG (n=1128)	Former ARNG (n=842)	Significance
Age, mean(SD)	39.6 (11.8) [range: 18-65]	39.1 (11.0) [range: 18-65]	40.3 (12.7) [range: 19-65]	***
Education, mean(SD)	14.1 (2.7)	14.1 (2.6)	14.1 (2.4)	Ns
Gender				
% Female	13.1	13.1	13.1	Ns
Race				
% White/Caucasian	83.9	83.3	84.7	Ns
Marital Status				
% Married	60.6	59.2	62.4	Ns
Rank				
Enlisted	32.8	27.9	39.4	
NCO	50.2	52.9	46.5	

Officer	17.0	19.2	14.2	***
Years of ARNG Service				
< 5 years	24.7	23.9	25.7	
5 or more years	75.3	76.1	74.3	ns
Deployment History				
% Deployed Previously	29.2	33.0	24.2	***
Presumptive PTSD				
%Yes	5.4	5.0	5.8	ns

*** p < 0.001

1. Examination of Hypotheses 1 & 7

As hypothesized (*Hypothesis # 1*), MA ARNG members report better functional health status (based on SF36V scores) than the general US population overall, and also stratified by age and gender. The US population norms for the Physical Component Summary (PCS, from the SF36V) and Mental Component Summary (MCS, from the SF36V) are 50 with standard deviation=10 (Ware et al., 1994).

As hypothesized (*Hypothesis # 7*), former MA ARNG members report significantly poorer physical and mental functional health compared to current members (**TABLE 7**). The results are similar when adjusting for age.

Table 7. SF36V summary scores- Comparison between current and former MA ARNG members.

	ALL PARTICIPANTS MEAN (SD)	CURRENT ARNG MEAN (SD)	FORMER ARNG MEAN (SD)	Significance level
SF36V SUMMARY SCORES				
PCS	52.78 (7.84)	53.43 (7.33)	51.91 (8.41)	***
MCS	53.17 (9.28)	53.66 (8.68)	52.51 (10.01)	***
SF36V Subscales:				
Physical Functioning	91.18 (18.04)	92.23 (17.54)	89.77 (18.62)	**
Role-Physical	93.18 (17.44)	94.34 (15.61)	91.63 (19.52)	***
Bodily Pain	79.58 (21.85)	80.85 (21.09)	77.87 (22.74)	**
General Health	77.67 (18.91)	79.77 (17.38)	74.83 (20.44)	***
Vitality	64.23 (19.57)	65.31 (18.46)	62.78 (20.89)	**
Social Functioning	89.31 (19.86)	90.36 (18.58)	87.01 (21.39)	**
Role-Emotional	93.96 (15.95)	94.90 (14.23)	92.69 (17.95)	**
Mental Health	77.59 (17.28)	78.46 (16.57)	76.42 (18.13)	**
HRA Physical Wellness Score(n=411)	87.56 (11.18)	88.83 (10.39)	83.96 (12.53)	***

* p < 0.05
** p < 0.01
*** p < 0.001

2. Examination of Hypotheses 2 & 6

We obtained HRA data for 570 of the survey responders and have utilized these data to address *Hypotheses #2 and #6*. As part of the HRA, a Physical Wellness score is computed (using an algorithm based on cholesterol levels, blood pressure, smoking status, seat belt use, and alcohol abuse). Also, using a cardiovascular disease (CVD) 10-year risk, or coronary prediction, algorithm developed and tested with data from the Framingham Heart Study (Peter et al., 1998 and also described on the CHPPM website), we computed CVD risk scores based on objective HRA information on blood pressure, cholesterol and HRA

data on age, gender, smoking status, and presence of diabetes.

Those persons with a CVD 10-year risk score of > 0.10 are recommended for further follow-up and preventative care. In our study, we were able to calculate the CVD risk score for 262 of the 530 males and 18 of the 40 females in our HRA dataset. Among males, 172 had risk scores < 0.10, 68 had scores between 0.10 and 0.15, 11 had scores of 0.16, 7 had scores of 0.20, and 4 had scores of 0.25. Those persons omitted where due to missing HRA item data and being < 30 years of age. (By design, the CVD algorithm is for those 30 years and older.)

As predicted *(Hypothesis #2)*, the Physical Functioning and Role-Physical subscales and the Physical Component Summary (PCS) from the SF36V are significantly correlated to the HRA Physical Wellness Score. Due to the small number of females within the HRA cohort (n=40), we examined the relationships between the CVD risk scores and functional health for males only. However, Physical Functioning and Role-Physical subscales and the Physical Component Summary (PCS) from the SF36V were not significantly correlated to the CVD 10-year risk scores.

As described in last year's AR (2004), we examined whether reported job stress on the HRA was correlated with ARNG and civilian job strain scores from the mail survey *(Hypothesis #6)*. HRA-reported occupational stress was associated with ARNG job strain characteristics and corresponded more with ARNG job strain than civilian job strain. Of the 541 persons with HRA data and who answered the question "How often do you feel your present work situation is putting you under too much stress?", 5.4% reported often, 26% reported sometimes, 44% reported seldom, and 25% reported never.
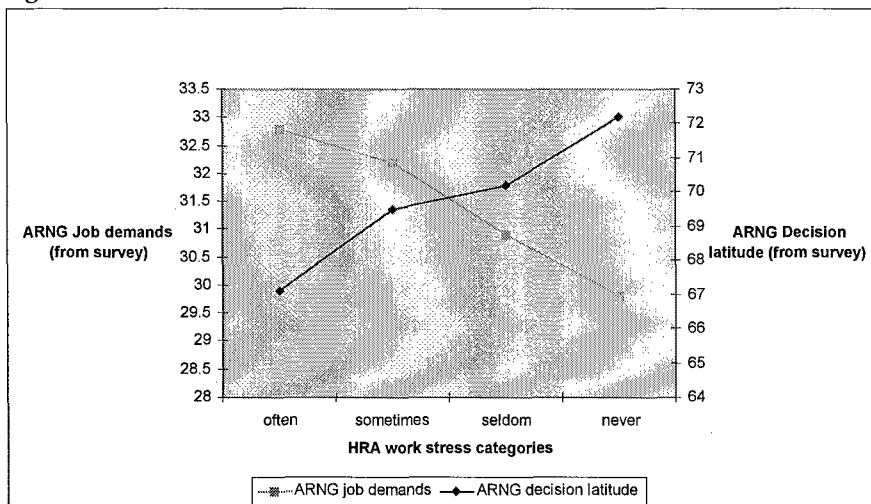
Figure 2.

Figure 2 presents the mean ARNG job demands and decision latitude (job control) scores by HRA work stress categories. As predicted, those who report a higher frequency of work stress on the HRA report higher ARNG job demands (F=4.2; df 3, p=0.006), lower levels of job control (F=1.8; df 3, p=0.15), and higher job strain (ARNG job demands divided by decision latitude, (F=7.9; df 3, p<0.001, data not graphed). HRA work stress is also associated with higher levels of civilian job demands but does not correspond with civilian job decision latitude scores.

Those persons reporting high ARNG job strain based on survey responses had significantly lower HRA Physical Wellness scores (High strain group mean =83.3 (SD 12.7) vs. others=88.3 (SD=10.6); Student's t-test=2.92, df 384, p=0.004). No significant differences were noted for the CVD risk scores in relation to high ARNG job strain, perhaps because those persons at higher CVD risk but remaining in the ARNG

have been moved to less stressful and/or demanding jobs. This reasoning is supported by the fact that CVD risk was significantly correlated with lower ARNG job strain (Spearman's rho=-0.17, p= 0.007).

3. Examination of Hypotheses 3, 4, & 5
As described in AR 2003, we conducted analyses to examine whether increased job demands or low job control as distinct independent variables and job strain (defined as high job demands divided by low job control; according to Karasek, 1985) in one's military and civilian job are related to lower functional health status, increased fatigue symptomatology *(Hypothesis #3)* and poorer ARNG and civilian job performance *(Hypothesis #4)*. Correlations between these independent and dependent variables suggest that ARNG job demands or degree of job control are not strongly correlated with worse physical functional health. However, higher levels of ARNG job control are significantly correlated with better mental functional health and lower fatigue levels. Increased ARNG job demands and less ARNG job control are significantly correlated with poorer ARNG job performance measures (e.g., missing work, injury on the job). Examination of *Hypotheses #4 & #5* has been carried out and an abstract describing this work was presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health Conference in March 2003 (Rosenman et al., 2003, see attached). In summary, ARNG job strain was not associated with adverse physical functional health. Civilian job strain was significantly associated with increased civilian job performance problems [regression coefficient =2.44 (SE=0.65), p<0.001], after adjusting for age, gender, education, marital status, rank, and civilian job satisfaction. Also, higher civilian job strain was associated with more job performance problems with increasing amounts of ARNG job strain [regression coefficient for the ARNG/civilian job strain interaction variable=3.875 (SE=1.605), p=0.02]. In a separate model, ARNG job strain was significantly associated with increased ARNG job performance problems [regression coefficient =3.45 (SE=0.70), p<0.001], after adjusting for age, gender, education, marital status, rank, and ARNG job satisfaction, but there was no evidence of an interaction effect between ARNG and civilian job strain on ARNG job performance.

Further examination of *Hypothesis #4* indicates that reported job insecurity, lower levels of coworker and supervisor support, and working in a hazardous environment with solvents are also significantly associated with more military job performance problems (all p < 0.01).

A manuscript describing the findings regarding Hypotheses #3, 4, 5 and aspects of Hypotheses #1 and 7 has been prepared (Title: Occupational Health of Army National Guard Members: Relationship between Job Demands and Health Status and Job Performance Measures). Currently, the manuscript is going through internal review by co-authors before submission.

Almost 30% of survey responders report a problem with exposure to dangerous chemicals at their current ARNG job as well as at their civilian job (AR 2004). About 13%, 67%, and 23% report having been exposed to pesticides, organic solvents, and metals, respectively, while working their ARNG jobs. As might be expected, those MOS categories reporting high rates of exposure to organic solvents include jobs that involve machine/engine repair and motor transportation operators (for example, 88M (motor transport operator), 62B (construction equipment repairer), 63B (light wheel vehicle mechanic), 12B (combat engineers)).

5. Examination of Hypothesis # 8

As described in AR 2004, we predict that those persons in high strain ARNG jobs would be more likely to leave the ARNG. But, rather than relying on the retrospective recall of National Guard job characteristics in those persons who have left the service, we will use 'MOS-assigned job strain' scores from current ARNG members to test this hypothesis. Based on current ARNG enlisted Soldiers participating in the survey, the mean job strain scores (using Karasek 1985 scoring) for the 4 high job strain MOSs are: 11B=0.5287 (SD=0.15); 12B=0.5156 (SD=0.13); 88M=0.5303 (SD=0.13); and

91B=0.5164 (SD=0.0.16). Unfortunately, we do not have sufficient reporting of MOS information from former NG survey responders in order to categorize the former members into high job strain MOSs to test Hypothesis #8. We are in the process of evaluating whether DMDC-recorded MOS information for this group can be utilized to proceed with the analyses.

As part of the survey, we queried current ARNG about how likely they thought they would leave the ARNG within the upcoming year ('intent to leave'). Those working in a high strain job were more likely to 'intend to leave' (OR=1.3, p=0.15).

D. Lessons Learned

♦ <u>Understanding survey response issues and generalizability of results.</u>
As described above, we initiated several avenues to better understand the reasons for participating or not deciding to participate in this mail survey study and to address the generalizability of study results.

♦ <u>Continued publicity and communication with research participants and ARNG personnel required.</u>
1) A study website (www.nationalguardresearch.org) was created to provide a more efficient way to provide information to potential subjects about the two related ARNG research projects.
2) Throughout the research period, the PI maintained email correspondence or met with the Adjutant General MG Keefe and COL Zimelman (MA ARNG State Surgeon) and unit commanders of the MA ARNG as well as the NG Surgeon to update them on the study's progression.

♦ <u>Recognition of need for long-term health and wellness surveillance automated database systems within ARNG.</u>
Throughout the course of this study the PI has been involved in conversations with several ARNG leaders about the nature of the current ARNG and total Army medical surveillance database systems, particularly in order to maintain and document medical readiness and longer-term chronic health issues within this military population. Several newer automated data systems exist (such as MEDPROS), but continued attention is needed to assess the capability and utility of these data systems to track prospective health issues pertaining to medical readiness research and surveillance.

♦ <u>Continued effort to better understand and maintain current information about the nature of specific military job categories.</u>
Military occupational codes (Army MOSs) are important tools to utilize for epidemiological research on deployment and military occupational health issues. In an ARNG work environment, both civilian and military job characteristics have the potential to impact functional health and job performance, and also potentially long-term health issues such as CVD.

FINAL REPORT- PROJECT #2
Health Status of Current National Guard Members: Deployment Health Issues

Approved SOW tasks for deployment health study funding periods & no-cost extension (Jun 2001-23 July 2005).
See NOTES section below for further description re: revised SOW rationale and timelines.

Year 1	June '01 (*NOTE #1)	
Task 1	Month 1	Orient project staff to project tasks
Task 2	Months 2-7	Interview and test group of both MA ARNG deployed and control groups: pre-deployment Set-up subject tracking procedures
Task 3	Months 4-12	Plan and test group of Bosnia-deployed subjects during-deployment
Task 4	Months 8-12	Analyze collected data
Year 2	July '02 (**NOTE #2)	
Task 1	Months 1-4	Continue analyses and plan scheduling logistics for immediate post-deployment testing and interviewing.
Task 2	Months 5-8	Interview and test group of MA ARNG deployed and control groups: immediate post-deployment
Task 3	Months 5-12	Carry-out longitudinal data analyses (examining hypotheses)
Task 4	Months 11-12	Plan & conduct the 1-year post-deployment follow-up.
Year 3	June '03 (***NOTE #3)	
Task 1	Months 1-6	Plan & conduct the 1-year post-deployment follow-up.
Task 2	Months 6-12	Carryout longitudinal data analyses.
Task 3	Months 6-12	Write final report; Manuscript preparation for publication submissions.

* NOTE #1: When this funding award was initially made in June 2001, the timetable in terms of the award was altered to end July 2003.
** NOTE #2: When a supplemental funding award was made in May/June 2002, the award timetable was revised to end January 2004 in order to complete the 1-year post-deployment follow-up testing and prospective analyses. As the start date for this project does not coincide with the annual cycle date of project #1, the annual reporting on this project is off-cycle by 6 months.
** NOTE #3: We have requested and been approved for a no-cost extension to this funding award to complete all statement of work tasks by July 23, 2005.

SUMARY OVERVIEW OF PROJECT STATUS

The deployment health study was initiated in July 2001 and therefore progress reports for each year of the funding award were provided with each of the previous Annual Reports. In this Final Report we summarize the work conducted over the entire research period, including work conducted since the last Annual Report (AR 2004) (**TABLE 8**).

TABLE 8. Summary Status of Final Set of Project Tasks

Task 1. Plan & conduct the 1-year post-deployment follow-up. **[STATUS: COMPLETED]** *Task 2.* Carry out longitudinal data analyses. **[STATUS: COMPLETED]** *Task 3.* Write final report **[STATUS: COMPLETED, with the submission of this Report]**   Manuscript preparation for publication submissions. **[STATUS: COMPLETED DRAFT** **PREPARATION for Paper #1 & now undergoing internal review by coauthors prior to submission.** **DRAFT PREPARATION BEING FINALIZED for Paper #2 prior to internal review by coauthors.]**

The Final Report for Project #2 is organized into four sections: Data Collection Summary and Methodological Issues, Hypotheses Examined, Results, and Lessons Learned.

A. Data Collection Summary and Methodological Issues

A total of 171 Massachusetts ARNG soldiers participated in this prospective study: 93 Bosnia-deployed and 78 non-deployed soldiers.

For purposes of discussion in this Report, we refer to the initial pre-deployment, baseline assessment with both groups in the Summer of 2001 as the "Time 1: Baseline" phase, the field assessment of Bosnia-deployed Soldiers in January of 2002 as the "Time 2: During-deployment" phase, the immediate post-deployment (with deployed group) and follow-up with the non-deployed comparison group in the Spring/Summer 2002 as the "Time 3: 1-year Follow-up" phase, and the final follow-up assessment with both groups in the Summer of 2003 as the "Time 4: 2-year Follow-up" phase.

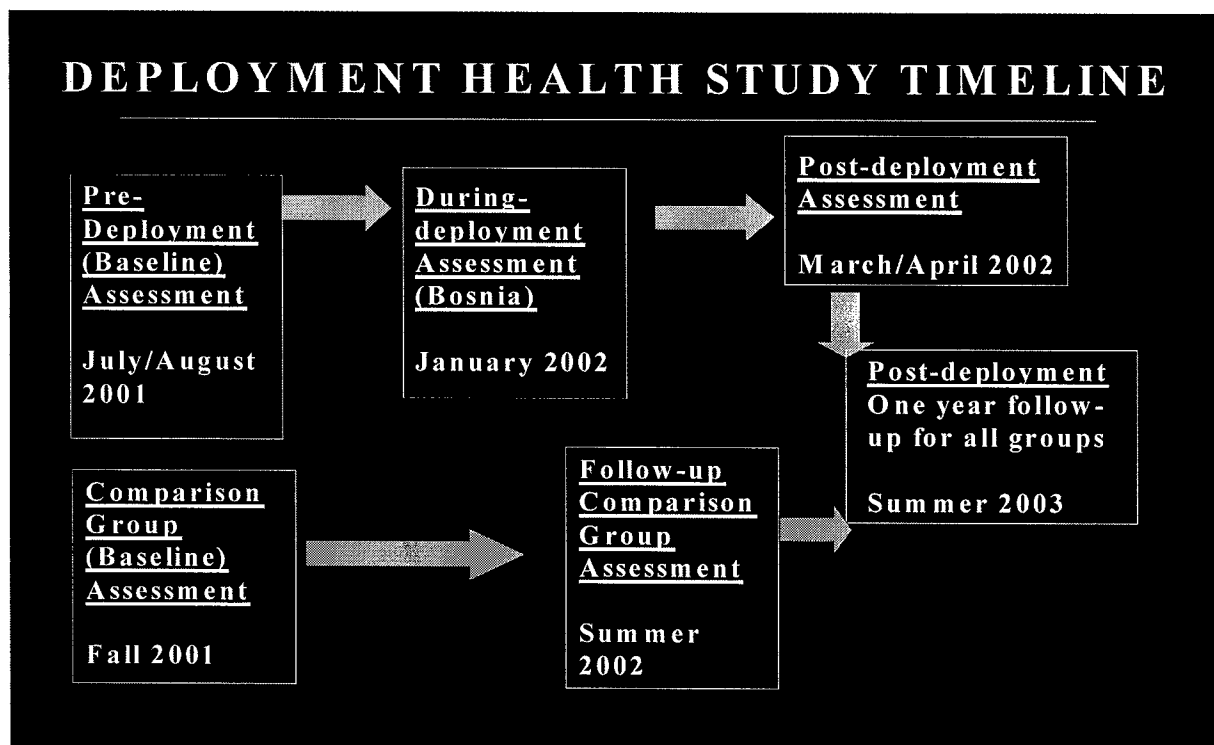**Figure 3** presents the Deployment Health Study timeline.

Figure 3.

1. Cohort tracking.
Over the study period, we have been able to track all cohort members in order to ascertain who has left the ARNG or remained in the ARNG over the course of the study. Almost 80% of the group remained in the MA ARNG over 2-year period of data collection (**TABLE 9**), with the majority of those still in the MA ARNG activated and serving on homeland security missions (**Figures 4A&B**). A significantly larger proportion of the non-deployed comparison group (23%) compared to the Bosnia-deployed group (9%) left the MA ARNG over the study period.
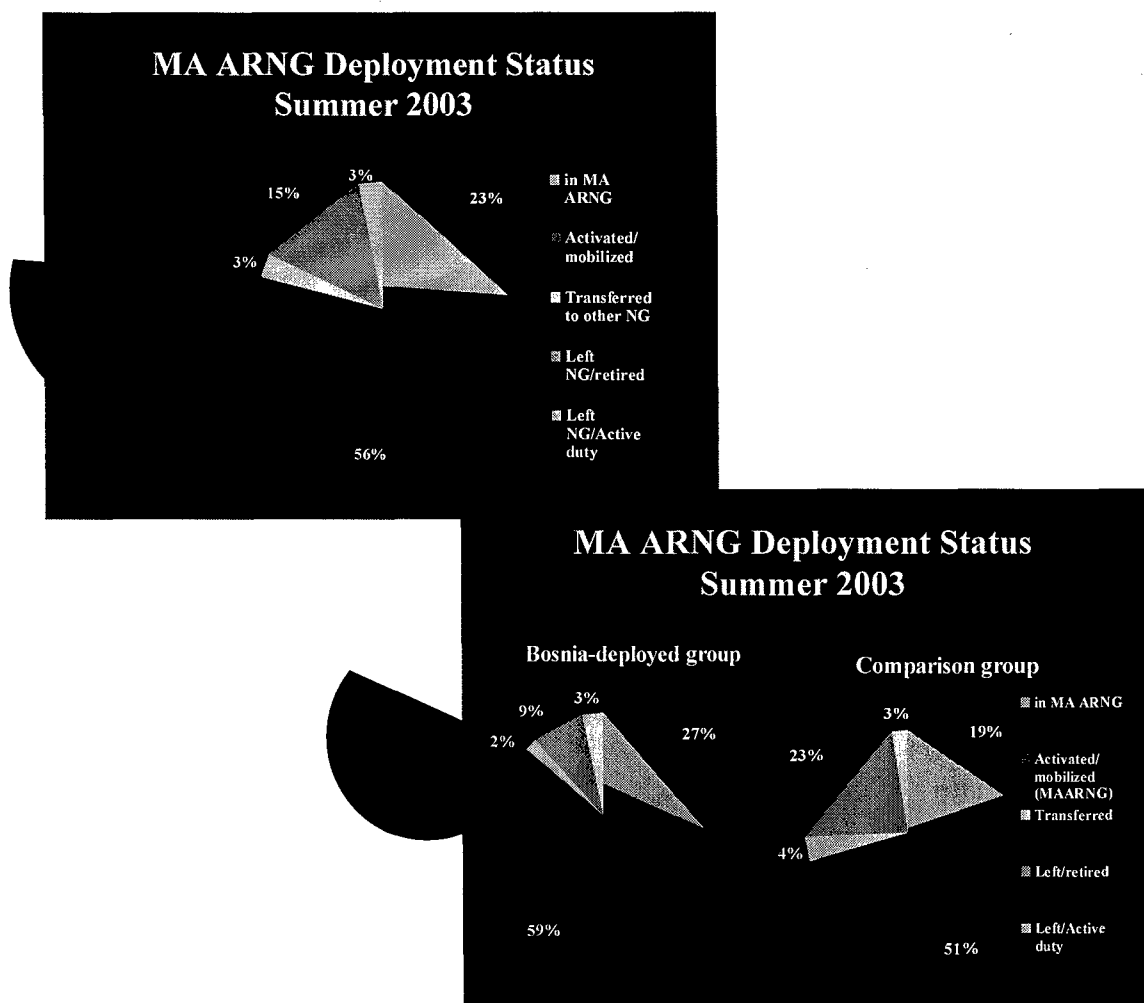
TABLE 9.

At TIME 1: Baseline	Currently, in MA ARNG	Mobilized/activated, serving on homeland security missions	Transferred to other state ARNG	Retired/ No longer in ARNG	On Active duty- Deployed
Overall (n=171)	23% (n=40)	56% (95)	3% (5)	15% (26)	3% (5)
Deployed Group (n=93)	27% (25)	59% (55)	2% (2)	9% (8)	3% (3)
Comparison Group (n=78)	19% (15)	51% (40)	4% (3)	23% (18) *	3% (2)

Status at TIME 4: 2-year Follow-up

$*p < 0.05$, significant difference between Deployed vs. Comparison-group at TIME 4.

Figures 4A&B.

2. Follow-up rates.

Over the course of the study, we have achieved a 73-79% follow-up rate (**TABLE 10**).

TABLE 10. Study Follow-up rates.

At TIME 1: Baseline

	Overall (n=171)	Deployed Group (n=93)	Comparison Group (n=78)
Time 2: During-deployment	*	76% (71)	
Time 3: 1-year Follow-up	79% (135)	84% (78)	73% (57)
Time 4: 2-year Follow-up	73% (124) §	78% (73)	65% (51)

§ At the Time 4 assessment phase, we reached close to a 90% follow-up rate with the group that remained in the MA ARNG over the 2-year data collection period.

Ninety-two percent of the participants (157/171) provided consent to access their AFQT, APRT, and medical records (to document reported medical conditions). Of those persons, we were able to obtain requested data (i.e., it exists) for approximately 70-82% of the group at the <u>Time 1: Baseline</u> phase. We were able to obtain HRA data for 57% of the group. At the <u>Time 4: 2-year Follow-up</u> phase the rates of retrieval were quite low (~20-33%, (**TABLE 11**). The primary reason for this low record retrieval rate was that we were not able to obtain information for most of those who had left the MA ARNG, were in another state's ARNG, or were on Active duty and deployed (~21%), or those currently serving on activated status (56%), as their records moved with them (out of state).

TABLE 11. Rates of Data Types Obtained

TIME 1: Baseline

AFQT	135/157 (86%)
APRT	120/157 (76%)
Medical Records	140/157 (89%)
HRA	97/157 (62%)

TIME 4: 2-year Follow-up

APRT	34/157 (20%)
Medical Records	57/157 (33%)

3. Generalizability of study results.

As reported on last year's AR, we examined the degree of descriptive comparability between our deployed study group (n=93) and the larger group of 225 MA ARNG soldiers who did deploy to Bosnia for SFOR10, as well as between the comparison study group (n=78) and the larger pool of 545 MA ARNG soldiers from same or similar unit types. Analyses of descriptive data from DMDC, being less or equal to 35 vs. greater than 35 years, high school education level v. less than HS, officer vs. enlisted, indicates that our study group is generally comparable to the larger group from which it came from. The exception is rank, as our Bosnia-deployed group included a higher proportion of officers (17%) compared to larger deployed group (8%). There were no significant differences between the proportion of officers in the non-deployed comparison group (4%) and the larger group of non-deployed soldiers (9%).

4. Computer-assisted neurobehavioral data.

As described in earlier AR documents, the primary health outcome of interest was the impact of deployment on neurognition/neurobehavior. The Core neurobehavioral task battery consists of selected tasks from the NES3 (**TABLE 12**).

TABLE 12. Core NES3 Battery Tasks

	Measure of:	Functional Domain
NES3 Finger tapping	Manual motor speed/dexterity; potential right-left differences	Psychomotor speed
NES3 Sequences A & B	Concentration and inhibition of automatic responding	Simple attention (A), Executive function (B)
NES3 Digit Symbol	Visual scanning and information processing speed	Motor, attention, visuospatial scanning
NES3 CPT-Letters	Reaction time, processing errors	Sustained attention

An additional request and amended SOW was submitted in June 2001 to include a during-deployment assessment (with the support and assistance of MAJ Ness, US Army Medical Research Unit-Europe) and to additionally include selected cognitive tests from the Automated Neurocognitive Assessment Module (ANAM, Reeves et al., 2000) in order to validate in comparison to NES3 tests. The ANAM is a computer-assisted cognitive test battery that has been developed over the past 20 years within the military setting. Several ANAM tasks have been adapted for administration via PDA (ARES battery). We included selected tasks from both the ANAM and ARES batteries as part of our assessment protocol. As such, a secondary objective of this study was to assess the feasibility and construct validity of administering selected ANAM tests in an operational environment.

Late last year (Fall 2004), we became aware of the potential for ANAM and ARES software bugs that might impact the calculated throughput scores to be used in analyses. We set up a collaborative agreement with Drs. Schlegel and Gilliland at the University of Oklahoma, Directors of the Center for the Study of Human Operator Performance (C-SHOP) which is now overseeing ANAM work, to carry out a quality control and assurance protocol on the ANAM and ARES software used in this study. Several calculated outcome scores did require application of re-calculation syntax. Drs. Schlegel and Gilliland provided their report and revised scores to Dr. Proctor in May 2005.

B. Hypotheses Examined

✓ *Hypothesis #1:* We predict that baseline functional health status and cognitive functioning do not differ significantly between the Bosnia-deployed and comparison, non-deployed groups of ARNG soldiers.

✓ *Hypothesis #2:* We predict that there will be differences in functional health status and cognitive functioning over time within Bosnia-deployed group, but no significant differences over time within comparison group.

C. Results

1. Examination of Hypothesis 1.

Although there are some significant differences between the deployed and comparison groups at baseline (i.e., age and officer status) as discussed above, no other significant differences between these groups at baseline (*Hypothesis #1*) were noted in terms of functional health status (V/SF12) (**TABLE 13**) and NES3 test performances (**TABLE 14**).

For the analyses of neurobehavioral task performances, outlier values were reviewed. Extreme values (more than 3 standard deviations (SD) from the group mean) were top- (or bottom-) coded and thus

assigned the value corresponding with the 3SD level. (Overall, less than 2% of cases required any truncation of values.) Transformations of the outcomes measures were also considered in an effort to yield approximate normality and homogeneity of variance. Several of the NES3 task scores required log-transformation.

TABLE 13. Descriptive Characteristics of Study Groups+ of ARNG Soldiers at Baseline, Time 1

	Deployed (D) N=88	Non-Deployed (ND) N=66	p-value
AFQT score at entry *	67.7 (18.1)	63.6 (20.7)	NS
Army GT score at entry *	111.0 (11.0)	109.2 (12.5)	NS
WRAT3 – Reading Standard Score *	102.9 (9.4)	101.3 (8.5)	NS
TOMM score *	48.7 (1.5)	48.5 (1.4)	NS
% White, Caucasian	83.0	75.8	NS
% English was first language spoken	95.5	86.4	.04
% Married	26.1	24.2	NS
% History of prior head injury where reported LOC>15 minutes	8.0	3.0	NS
% Right-handed	90.9	93.9	NS
% History of prior overseas deployment	22.7	18.2	NS
Familiarity with computers: % Very familiar % Moderately % Somewhat % Not at all	31.8 39.8 21.6 6.8	45.5 28.8 22.7 3.0	NS
V/SF12 PCS *	54.4 (4.5)	53.2 (5.5)	NS
V/SF12 MCS *	55.1 (6.2)	53.2 (8.2)	NS
PCL summary score	26.3 (10.3)	27.2 (10.4)	NS
% Presumptive PTSD	4.6	4.6	NS
% High job strain	21.6	15.6	NS

NS not significant, p> .05
+ Participants who did all study parts at baseline: questionnaire, interview, and NES3 testing.
* Higher score indicates better or higher levels of functioning.

TABLE 14 Comparison of Deployed and Non-Deployed Groups at Baseline on NES3 Task performances.

|	Deployed (D)			Non-Deployed (ND)			t-statistic	p-value
	Mean (SD)	Range	Skewness	Mean (SD)	Range	Skewness		
NES3 TASKS								
Finger Tapping: Dominant Hand # taps	61.6 (7.9)	47-85	0.69	60.6 (8.1)	47-84	0.69	-0.78	NS
Non-Dominant Hand, #taps	54.3 (7.4)	39-75	0.86	53.3 (6.2)	42-68	0.52	-0.94	NS
Sequences A: Response time (sec)	17.9 (6.2)	8.0-43.2	1.23	18.2 (5.0)	9.7-30.7	0.40	0.38	NS
Sequences B: Response time (sec) ¶	3.4 (0.4)	2.6-4.5	0.36	3.5 (0.4)	2.6-4.3	-0.009	0.97	NS
# Errors ¶	0.32 (0.5)	0-1.8	1.3	0.38 (0.49)	0-1.9	1.0	0.71	NS
Digit Symbol: Response time (sec) ¶	4.6 (0.1)	4.3-5.1	0.85	4.6 (0.1)	4.3-4.9	0.11	-0.23	NS
CPT Letters: Reaction time (msec) ¶	6.0 (0.1)	5.7-6.4	0.72	6.0 (0.1)	5.7-6.3	0.22	1.16	NS
# non-responses ¶	0.11 (0.28)	0-1.4	2.4	0.17 (0.32)	0-1.1	1.5	1.2	NS
# false positives ¶	0.31 (0.45)	0-1.6	1.1	0.43 (0.51)	0-1.6	0.71	1.5	NS
MOOD								
POMS: Total Score	115.7 (31.1)	72-215	1.2	120.5 (33.3)	73-215	0.99	0.92	NS
Anger	45.6 (7.6)	37-70	1.3	46.5 (8.0)	37-70	0.86	0.66	NS
Depression	40.0 (6.4)	35-71	2.3	40.8 (6.8)	35-68	1.8	0.73	NS
Confusion	39.6 (7.0)	32-69	1.7	40.3 (6.2)	32-58	0.72	0.61	NS
Tension	39.5 (7.1)	30-61	1.2	38.6 (7.1)	30-60	1.0	-0.79	NS
Fatigue	43.7 (6.7)	37-75	1.6	44.5 (7.0)	37-66	0.94	0.74	NS
Vigor	63.3 (8.7)	41-80	-0.27	60.2 (9.3)	41-80	-0.16	-2.14	.03

¶ log transformed mean and standard deviation of mean presented
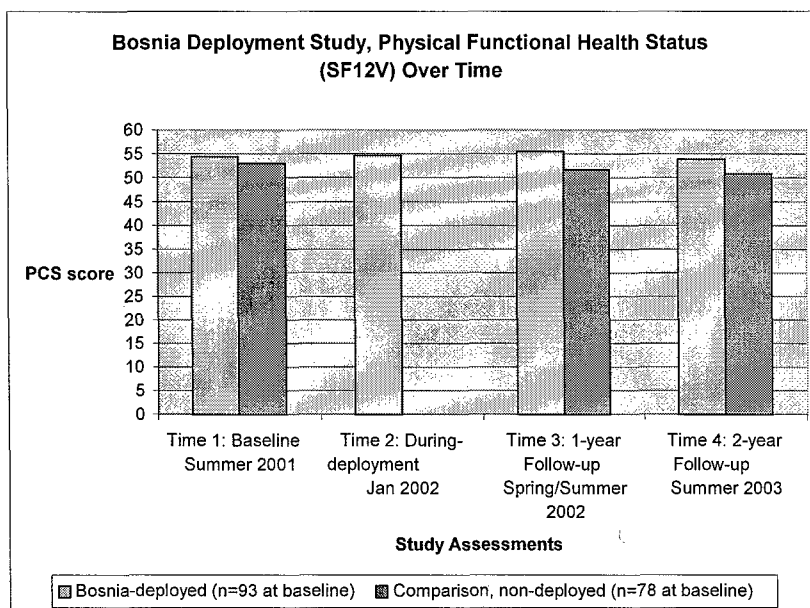NS non-significant, p>.05

2. Examination of Hypothesis 2.

To address **Hypothesis #2**, a series of analyses have been conducted, starting with the preliminary descriptive analyses described in prior ARs. Over the 2-year data collection period, we note that there are overall changes in both the Physical Component and Mental Component Summary scores (from the SF12V, Kazis 1999) over time (**Figure 5**).
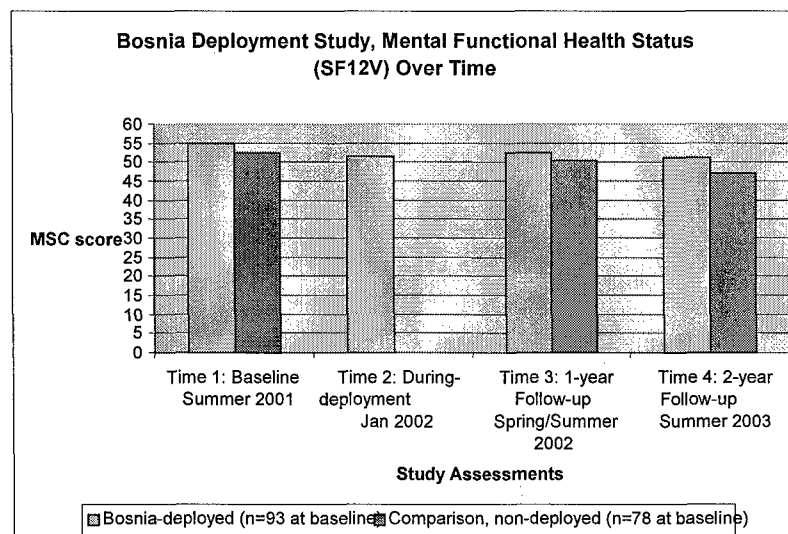
Figure 5.

Functional Health Status, Bosnia Deployment Study
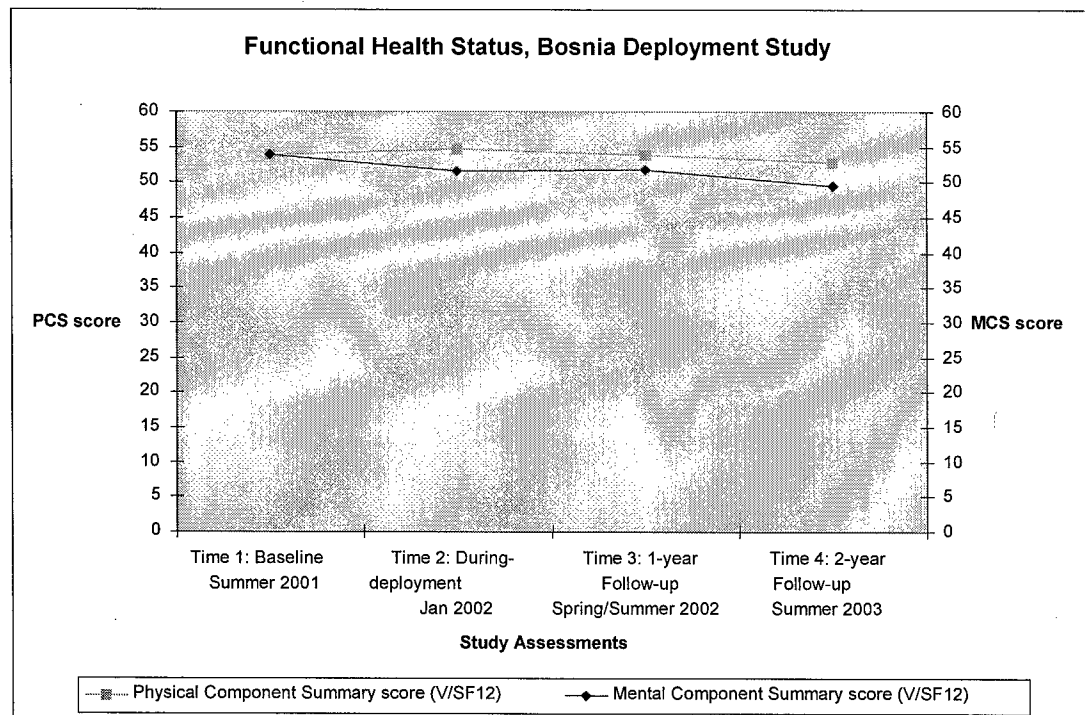
As described in last year's AR, the deployed group reported significantly higher (better) physical functioning immediately after deployment; but, over the second year of the study both physical and mental functional health declined (**Figures 6A & B**).

Bosnia Deployment Study, Physical Functional Health Status (SF12V) Over Time

Figures 6A&B

Bosnia Deployment Study, Mental Functional Health Status (SF12V) Over Time

Results of earlier analyses about whether deployment-related job characteristics are related to changes in functional health status or reported cognitive functioning was presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health Conference in March 2003 (Dutille et al., 2003). In summary, the deployed soldiers' physical functioning improved between the pre- and post-deployment assessments (pre-deployment=54.4 (4.6), post-deployment=55.6 (3.4); paired t-test= -2.1, p=0.04) for the 77 deployed soldiers who completed both pre- and post-deployment assessments. Soldiers' cognitive functioning (CF) was worse over this time period (pre-deployment=87.3 (11.1), post-deployment=83.6 (16.7); paired t-test=1.9, p=0.06). Through hierarchical regression analyses that controlled for age, education level, rank, and pre-deployment functioning, deployment-related job strain changes were not found to be significantly associated with post-deployment physical health functioning. However, increased job strain over deployment was significantly associated with worse post-deployment self-

reported cognitive functioning (regression coefficient=-18.1 (SE=5.5), p=0.002). No significant group level differences in job strain or unit cohesion between three deployed units were noted.

<u>Additional examination of deployment-related changes.</u>
Analyses have been performed in SAS using generalized estimation equations (GEE) models to examine the repeated measures effects in the two groups over time. The models examined whether there was a significant difference in outcome over time that was related to deployment (Deployment*visit (time) model) adjusting for age, education level, rank, and unit cohesion. Separate models were run for the two functional health summary scores from the SF12V (PCS, MCS), six POMS subscales (anger, tension, fatigue, depression, vigor, and confusion) and for the nine NES3 task outcomes of interest (Finger Tapping dominant and non-dominant hand, Sequences A response time, Sequences B response time and number of errors, Digit Symbol response time, CPT response time and number of false positive and non-response errors). Significant deployment*time interaction effects were observed for 6 of these outcomes; that is, the deployed group performed significantly different from the non-deployed group over the deployment time period (**TABLE 15**).

TABLE 15.

	Deployed	Non-deployed	Deployment* time Interaction term significance
SF12-PCS	2.17	-1.18	p=0.03
FT-NON	2.14	4.75	p=0.01
CPTtime	0.02	-0.007	p=0.004
POMS tension	2.0	1.51	p=0.007
POMS depression	-0.59	1.72	p=0.008
POMS vigor	-6.04	-1.95	p=0.03

Over the deployment period, the deployed group reported significantly higher (better) physical functioning (2.2 points higher compared to −1.2 points lower in the non-deployed group), adjusting for age, education level, rank, and unit cohesion. The deployed group performed significantly slower than the non-deployed group on tasks involving sustained attention (CPT response time) and made fewer numbers of taps with the non-dominant hand compared to the non-deployed group over the same time period. Of note, the deployment*time interaction effect for the number of false positive errors made on the CPT task was of borderline significance (p=0.11), with deployed group making fewer errors compared to the non-deployed group. This finding suggests that being on a peacekeeping deployment mission promotes a strategic performance change (longer response time taken with fewer errors made) on this task of sustained attention.

Significant differences were also noted for the POMS tension and vigor subscales where the deployed group reported significantly more tension and decreased vigor over time. The deployed group reported less depression over deployment, however this may be due to timing of the post-deployment assessment as it was conducted soon after return from Bosnia (within 3-21 days). Levels of depressive mood symptoms were significantly elevated when assessed during-deployment among the deployed group.

We also have explored whether the deployment*time interaction effects observed are due to changes in job strain over time. No confounding by job strain was observed among the identified 6 outcomes above. However, a change to a high job strain job over time was significantly associated with increased anger and fatigue over time, independent of deployment status. In addition, a significant interaction between deployment status, high job strain, and time was observed for the POMS confusion subscale (p=0.05) and a borderline association with POMS fatigue (**TABLE 16**). For both mood outcomes, being deployed and high job strain over time was significantly associated with more fatigue and confusion.

TABLE 16.

	Deployed and high job strain	Deployed and no job strain	Non-deployed and high job strain	Non-deployed and no job strain	Deployment* Job strain*time Interaction term significance
POMS fatigue	6.46	1.14	1.75	1.72	p=0.10
POMS confusion	4.74	0.50	-0.01	1.21	p=0.05

3. Additional Analyses conducted to examine factors related to administering computer-assisted neurobehavioral tasks in a military operational environment.

There are two primary aims for these analyses, which are currently in progress. The first objective is to examine the psychometrics of the computer-assisted tasks and assess the relationships between ANAM and ARES and predicted risk factors, such as relationship with age and education level, familiarity with computers and video games. The second objective is to examine the relationships between NES3 tasks and subsets of ANAM and ARES tasks, particularly whether underlying functional constructs assessed by the NES3 battery tasks were concordant with the ANAM and ARES battery tasks, using shared variance methods of convergent validity and exploratory factor analytic techniques.

TABLES 17 and 18 present aspects of the psychometric data for data collection on the deployed group during deployment. And as predicted, NES3, ANAM and ARES performances are significantly associated with age, education level, and familiarity with computers. There was no significant association between performances on the ARES tasks with familiarity with video games.

TABLE 17 During-Deployment Data Summary

		N	Mean	SD	Range	Skewness
NES3 tasks		•				
Finger tapping: Dominant hand, # taps	FT-d	66	61.6	8.1	35-80	-0.23
Finger tapping: Non-dom. hand, # taps	FT-nd	66	54.1	7.2	41-77	0.97
Sequences A: Response latency (sec)	SeqA-lat	66	17.9	6.4	9.2-39.3	1.5
¶Log- transformed Seq A	LSeqA-lat	66	2.8	0.32	2.2-3.7	0.57
Sequences B: Response latency (sec)	SeqB-lat	66	30.6	11.6	13.7-64.7	1.0
¶Log- transformed Seq B	LSeqB-lat	66	3.4	0.36	2.6-4.2	0.21
# Errors ¶	LSeqB-err	66	0.24	0.40	0-1.4	1.3
Digit Symbol: Response latency (sec)	DS-lat	66	101.1	18.0	77.3-153.3	1.2
¶Log- transformed Digit Symbol	LDS-lat	66	4.6	0.17	4.4-5.0	0.82
CPT-Letters: Mean reaction time (msec)	CPT-rtm	65	403.1	40.4	337.5-517.0	1.1
¶Log- transformed CPT	LCPT-rtm	65	6.0	0.10	5.8-6.3	0.83
# Non-responses ¶	LCPT-nr	65	0.14	0.30	0-1.1	1.9
# False positives ¶	LCPT-fp	65	0.22	0.39	0-1.4	1.4
Profile of Mood States, POMS (t-scores):						
Fatigue	POMS-F	66	45.5	8.6	33-71	1.1
Anger	POMS-A	66	48.6	11.3	37-80	1.4
Depression	POMS-D	66	41.0	7.8	35-65	1.7
Confusion	POMS-C	66	39.5	7.8	32-64	1.7
Tension	POMS-T	66	38.7	8.4	30-62	1.2
Vigor	POMS-V	66	59.5	8.6	38-80	0.03

TABLE 18 During-Deployment Data Summary

		N	Mean	SD	Range	Skewness
ANAM tasks (mean throughput scores):						
Simple Reaction Time	A-SRT tp	66	215.2	50.6	71.2-285.9	-0.89
Code Substitution-Immediate	A-CSI tp	66	52.4	11.5	24.5-72.4	-0.40
Matching to Sample	A-M2S tp	66	33.1	12.5	9.4-71.0	0.67
Running Memory	A-RM tp	66	101.1	16.8	57.9-137.0	-0.07
Code Substitution-Delay	A-CDS tp	66	47.0	15.9	15.1-77.2	-0.18
ARES tasks (mean throughput scores):						
Simple Reaction Time	R-SRT tp	56	206.1	35.2	84.6-272.0	-1.5
Logical Reasoning	R-LR tp	56	20.8	8.4	3.0-46.7	0.21
Math Processing	R-MP tp	54	19.3	5.8	7.0-29.0	-0.15
Matching to Sample	R-M2S tp	56	31.6	11.4	11.0-66.0	0.53
Running Memory	R-RM tp	40	106.5	24.0	34.0-148.0	-0.54
Memory Search	R-MS tp	56	63.0	20.7	0.90-105	-0.50
ANAM mood scales (mean scores):						
Activity	A-act	65	2.2	0.50	1.0-3.0	-0.14
Happiness	A-hap	65	2.2	0.52	1.0-3.0	-0.42
Anger	A-anger	65	1.4	0.55	1.0-3.0	1.7
Depression	A-depr	65	1.3	0.49	1.0-2.8	1.8
Anxiety	A-anx	65	1.2	0.28	1.0-2.0	1.1
Fatigue	A-fatigue	65	1.5	0.47	1.0-2.7	0.75
ANAM Sleep Scale (mean)	A-Sleep	65	3.1	1.3	1-7	0.83
ARES Sleep Scale (mean)	R-Sleep	54	2.8	1.2	1-7	0.94

We have performed convergent validity procedures to examine the relative correlations between POMS mood subscales and those from the ANAM battery (**TABLE 19**). The ANAM-Activity, -Fatigue, -Anger, -Anxiety scales are most highly correlated with the comparable POMS subscale, however the results for the ANAM-Happiness and –Depression subscales both are most highly correlated with the POMS Anger subscale. Further work is in progress to describe relationships between NES3 tasks and subsets of ANAM and ARES tasks using shared variance methods of convergent validity and exploratory factor analytic techniques.

TABLE 19- MOOD and Sleep scale Correlations with POMS subscales

	POMS-Anger	POMS-Tension	POMS-Depression	POMS-Vigor	POMS-Fatigue	POMS-Confusion	CIS20-Fatigue Scale
ANAM-Activity	-0.453	-0.524	-0.394	**0.656**	-0.495	-0.481	-0.565
ANAM-Fatigue	0.687	0.725	0.662	-0.561	**0.776**	0.648	0.706
ANAM-Happiness	**-0.698**	-0.663	-0.579	0.583	-0.580	-0.574	-0.586
ANAM-Depression	**0.875**	0.822	0.851	-0.441	0.731	0.784	0.699
ANAM-Anger	0.867	0.798	0.736	-0.358	0.651	0.760	0.667
ANAM-Anxiety	0.715	**0.750**	0.733	-0.340	0.565	0.683	0.556
ANAM-Sleep	0.606	**0.620**	0.500	-0.390	0.576	0.595	0.582
ARES-Sleep	0.583	0.666	0.566	-0.353	**0.673**	0.620	0.626

N=65 for ANAM to POMS correlations
N=54 for ARES Sleep to POMS correlations
Correlation between ANAM and ARES Sleep=0.668

* for all presented correlations, p<0.0001; Spearman correlations are presented for analyses with ANAM/ARES Sleep Scale, as these are ordinal scale scores.

Bold- POMS subscale most correlated with ANAM subtest; for example: ANAM Activity is most highly correlated with POMS Vigor.
Underline- ANAM subtest most correlated with POMS subscale or CIS20 Fatigue Scale; for example: POMS Vigor is most highly correlated with ANAM- Activity; CIS20 Fatigue Scale is most highly correlated with ANAM- Fatigue and ANAM-Depression

A manuscript describing the findings regarding Hypotheses #1 and 2 has been prepared (Title: Prospective Assessment of Functional Health and Neurobehavior in Army National Guard Soldiers Over a Peacekeeping Deployment Mission;). Currently, this manuscript is going through internal review by co-authors before submission. Another manuscript focusing on administration of computer-assisted neurobehavioral task batteries in a field epidemiology setting also is being prepared (Title: Examination of Neurobehavior in Military personnel Deployed on a Peacekeeping Mission: Factors related to the validity of the computer-assisted neurobehavioral battery tasks in a field epidemiology setting).

D. Lessons Learned

♦ <u>Maintain communication with study participants for continued tracking efforts.</u>
  1) Due to the importance of continued participant tracking efforts in a prospective study design, we initiated newsletter mailings to update participants on study progress and to maintain current addresses. A collaborative working arrangement with the MA ARNG Surgeon's office and the Commander at the US Army Research Unit-Europe in Germany greatly facilitated and helped ensure completeness in tracking the status of all study participants.
  2) The number of recent ARNG call-ups for deployment and homeland security missions (i.e., > 33% of MA ARNG soldiers have been activated or deployed in 2003-2004) and the classified nature of the identities of deployed/activated soldiers has required continued contact with MA ARNG headquarters and commanders to be kept aware of these changes to the extent possible.

♦ <u>Address generalizability of results.</u> Through efforts from another study undertaken under IRB-exempt status, we are able to obtain additional information to better understand the comparability between those soldiers who have participated in this study and the group who did not and thus provide estimates of the generalizability of the study results. By design, the study results are generalizable to ARNG soldiers on peacekeeping deployments, but not necessarily to combat missions.

FINAL REPORT
KEY RESEARCH ACCOMPLISHMENTS

Project #1-specific:

➢ Developed a focus group/telephone interview guide to systematically query current and former ARNG members about their jobs and aspects of their jobs that might impact their health.

➢ Developed a comprehensive survey instrument, with good estimates of survey scale characteristics and internal consistency reliabilities, to systematically query current and former ARNG members about their jobs and aspects of their jobs that might impact their health.

➢ Established a data management system to enable efficient integration of the collected survey data with the HRA data obtained from MA ARNG databases.

➢ Completed the mail survey data collection procedures.

➢ Conducted efforts to address the generalizability of study results, via a telephone interview with survey non-respondents.

➢ Initiated a data analysis and manuscript preparation timetable.

Project #2-specific:

➢ Established a cohort of Bosnia-deployed MA ARNG subjects for prospective study.

➢ Established a comparison group of non-deployed MA ARNG members for prospective study.

➢ Laid the groundwork to include and integrate other medical-type data records (HRA, medical records, AFQT, and APRT) into the dataset for analyses in this prospective study.

➢ Integrated ANAM tests into the study protocol in order to conduct a validation study of selected ANAM tests in comparison to performance on comparable NES3 tests in cross-sectional analyses.

➢ Tested the administration of ANAM tests on a hand-held computer device (ANAM Readiness Evaluation System, ARES) in the field.

➢ Successfully established and maintained a field study research team that is trained to conduct the study protocol in prospective field study settings with military personnel.

➢ Initiated a data analysis plan to address various aspects of longitudinal data analyses methods, as well as a manuscript preparation timetable.

➢ Collaborated with colleagues at the University of Oklahoma (C-SHOP) to conduct quality control and assurance on the ANAM and ARES software used in this study.

Research accomplishments central to both projects:

➢ Establishment and continued updating of a study website as an efficient communication to and from research subjects and other interested parties.

➢ Study newsletters to participants to update them on the progress of the study (also posted on the study web-site).

Bulleted list of manuscripts/abstracts to date:

• Proctor SP, Rosenman ES, Heeren T, Wolfe J. Characteristics of Army Personnel Remaining in the National Guard Six Years After Gulf War Deployment: A Descriptive Analysis. Presented at the Conference on Illnesses among Gulf War Veterans, Alexandria, VA; January 2001.

• Dutille KE, Rosenman ES, Pepper L, Proctor SP. Deployment-related job strain and health among Army National Guard members. Presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 22, 2003.

• Rosenman ES, Dutille KE, Pepper L, Proctor SP. Civilian Job Strain and Performance in Army National Guard Members. Presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 21, 2003.

- Proctor SP, Dutille KE, Rosenman ES, Zimelman A, Ness J, Reeves D, Elsmore T. Deployment Health Research Study: Computer-assisted assessment of cognitive performance among Army National Guard Members. Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.
- A summary article describing both of these ARNG projects was published on DeploymentLINK (www.deploymentlink.osd.mil) and in the Summer 2002 issue of the Deployment Quarterly.
- Two manuscripts, one from each the two projects, have been prepared and undergoing internal review by co-authors. Another manuscript describing factors related to the validity of the computer-assisted neurobehavioral tasks used is being prepared for submission. (Paper titles: Occupational Health of Army National Guard Members: Relationship between Job strain and Health Status and Job Performance Measures; Prospective Assessment of Functional Health and Neurobehavior in Army National Guard Soldiers Over a Peacekeeping Deployment Mission; Examination of Neurobehavior in Military personnel Deployed on a Peacekeeping Mission: Factors related to the validity of the computer-assisted neurobehavioral battery tasks in a field epidemiology setting).

FINAL REPORT
REPORTABLE OUTCOMES
- Presentations, Abstracts and Manuscripts
- Active Collaborations (in addition to MA ARNG collaborations)
- Research training opportunities
- Funding opportunities

1. Presentations, Abstracts and Manuscripts

❖ Presentations:
   Proctor SP, Dutille KE, Rosenman ES, Ness J, Reeves DL. Computer-based assessment of cognitive abilities in a deployment health research study of US Army National Guard Members. Presented at the International Applied Military Workshop "From Computer-based Assessment to Augmented Cognition: Improving the Use of Computers from Selection to Operational Environment", hosted by the Austrian Ministry of Defense in Vienna, Austria, June 10, 2002.

   Proctor SP. *Invited Speaker*- Examining the Occupational Health of Massachusetts Army National Guard Members. Presented at the Army National Guard program and the 108th Annual AMSUS (Association of Military Surgeons of the US) Meeting, November 13, 2002, Louisville, Kentucky.

   Proctor SP. Examining the Occupational Health of Massachusetts Army National Guard Members. 6th Annual Northeast Regional AMEDD Conference, January 26, 2003, Hanscom AFB, Bedford, Massachusetts.

   Proctor SP. Health Status of Current National Guard Members: Deployment Health Issues. Presented at the AIBS Force Health Protection Review Program, February 25, 2003, San Diego, California.

   Proctor SP, Dutille KE, Rosenman ES, Zimelman A, Ness J, Reeves D, Elsmore T. Deployment Health Research Study: Computer-assisted assessment of cognitive performance among Army National Guard Members. Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.

   Proctor SP. Examining the Occupational Health of Massachusetts Army National Guard members: Research Status Report. 7th Annual Northeast Regional AMEDD Conference, January 25, 2004, Hanscom AFB, Bedford, Massachusetts.

❖ Presented Abstracts (See attachments):

   Proctor SP, Rosenman ES, Heeren T, Wolfe J. Characteristics of Army Personnel Remaining in the National Guard Six Years After Gulf War Deployment: A Descriptive Analysis. Presented at the Conference on Illnesses among Gulf War Veterans, Alexandria, VA; January 2001.
        The PI is also longitudinally following a group of Gulf War veterans (Devens cohort) and has recently performed a descriptive study on the factors related to retention in the ARNG following GW service within the Devens cohort. (A copy of the Abstract is included in the *Appendix*.) Those who were officers during the GW and those who reported a higher level of unit cohesion and leader support (as measured by WRAIR unit cohesions scales; Marlowe, 1987) during their GW service were more likely to have remained in the ARNG

six years post deployment. Also, these factors are independently associated with higher levels of physical functioning six years after GW service. These results suggest that the support in the 'work' environment during deployment is an important factor in retention in the service, as well as functional health. In the current survey study, we will also examine the role of unit- and leader-level support (as well as family and civilian work support networks) in the relationship with health status and ARNG retention.

Dutille KE, Rosenman ES, Pepper L, Proctor SP. Deployment-related job strain and health among Army National Guard members. Presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 22, 2003.

Rosenman ES, Dutille KE, Pepper L, Proctor SP. Civilian Job Strain and Performance in Army National Guard Members. Presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 21, 2003.

Proctor SP, Dutille KE, Rosenman ES, Zimelman A, Ness J, Reeves D, Elsmore T. Deployment Health Research Study: Computer-assisted assessment of cognitive performance among Army National Guard Members. Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.

❖ A summary article describing both of these ARNG projects was published on DeploymentLINK (www.deploymentlink.osd.mil) and in the Summer 2002 issue of the Deployment Quarterly.

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2. Active Collaborations (in addition to MA ARNG collaborations)

❖ With colleagues MAJ Ness, CDR Dennis Reeves, and Dr. Timothy Elsmore to work on development and validation aspects of the ANAM & ARES.
❖ With Dr. Ryan of the Millennium Cohort Study, in order to examine generalizability of results.
❖ With Tom Mangione, PhD and JSI (for their survey methodology expertise).
❖ With Dan and Lynda King, PhD to explore additional longitudinal data analyses methods.
❖ With Drs. Schlegel and Gilliland at the University of Oklahoma (C-SHOP) to conduct quality control and assurance on the ANAM and ARES software used in this study and participation in on-going Workshop meetings regarding ANAM and ARES issues.

3. Research training opportunities

Five Boston University School of Public Health students have worked as Research Assistants on these projects. Two of them graduated with MPH degrees in May 2003, 1graduated in Jan 2004, 1 graduated in May 2005, and 1 is scheduled to graduate in May 2006.

4. Funding applications based on work supported by this award

□ With Dr. Jennifer Vasterling (clinical neuropsychologist) from the New Orleans Veterans Affairs Medical Center, the PI was awarded joint DoD and VA funding to carry out a prospective assessment of changes in neurocognition pre- and post- deployment in to-be-deployed (2003) Gulf and non-Gulf deployed military personnel (#DAMD17-03-2-0020; Prospective Assessment of Neurocognition in Future Gulf-Deployed and Gulf-Nondeployed Military Personnel: A Pilot Study. PI: Jennifer J. Vasterling, Ph.D.; Co-PI: Susan P. Proctor, D.Sc.). This new project, the Neurocognition Deployment Health Study (Vasterling et al. in press), follows a similar design and methodology to the PI's current study of Bosnia-deployed MA ARNG soldiers and data collection was initiated in April 2003. As of August 2005, a total of ~1,400 Active-duty and 174 National Guard Army soldiers (including a Iraq-deployed group and a comparison group of non-deployed soldiers) have participated in the pre-deployment assessment phase. And, we have completed post-deployment assessments with over 1,000 to date.

□ Additional studies focused on environmental exposure hazards (specifically, neurotoxicants) of military service are planned or are underway.

CONCLUSIONS

Recent efforts in the area of deployment health and Force Health Protection appear largely focused in the Active duty arena. There is also a need to provide some focused effort on National Guard and Reserve forces and this research need has been identified by the Institute of Medicine (1999, 2000) and mentioned at the recent session concerning Force Health Protection at the Conference on Illnesses among Gulf War Veterans (January 2001). The Army National Guard operates under a somewhat different structure than the Active Duty Army: politically, bureaucratically, and socially. Thus, to be most beneficial in designing effective strategies in deployment health protection one needs to understand the nature of who and what make up the ARNG forces in this current climate, as well as the State and National frameworks in which they operate. The two projects conducted under this funding award are some of the first to focus of the specific occupational health issues surrounding ARNG service and deployment health. The current deployment climate of rapid operational tempo within ARNG Soldiers reinforces the need to better understand the impact that ARNG occupational characteristics may have on current and long-term health.

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APPENDIX

    LIST OF PERSONNEL SUPPORTED
    BIBLIOGRAPHY
    ABSTRACTS
    SURVEY- TABLE OF CONTENTS

LIST OF PERSONNEL (in addition to PI)

Erik Rosenman
Janice Weinberg
Lewis Pepper
Kathryn Dutille
Jordan Robbins
Mary McGarigle
Kim Sullivan
Cindy Stinson
Veronica Viera
Rachel Busby
Kristen Weida
Kristin Heaton
Pat Marchese

Jaime Butler-Dawson (short-term, work study student)
Aleruchi Mpi (short-term, work study student)

5 Steering/Advisory Committee members (paid honoria only)

BIBLIOGRAPHY

* Abstracts included

Proctor SP, Rosenman ES, Heeren T, Wolfe J. Characteristics of Army Personnel Remaining in the National Guard Six Years After Gulf War Deployment: A Descriptive Analysis. Presented at the Conference on Illnesses among Gulf War Veterans, Alexandria, VA; January 2001.

The PI is also longitudinally following a group of Gulf War veterans (Devens cohort) and has recently performed a descriptive study on the factors related to retention in the ARNG following GW service within the Devens cohort (referenced above, Proctor et al., 2001). Those who were officers during the GW and those who reported a higher level of unit cohesion and leader support (as measured by WRAIR unit cohesions scales; Marlowe, 1987) during their GW service were more likely to have remained in the ARNG six years post deployment. Also, these factors are independently associated with higher levels of physical functioning six years after GW service. These results suggest that the support in the 'work' environment during deployment is an important factor in retention in the service, as well as functional health.

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MEETING ABSTRACTS

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CHARACTERISTICS OF ARMY PERSONNEL REMAINING IN THE NATIONAL GUARD SIX YEARS AFTER GULF WAR DEPLOYMENT: A DESCRIPTIVE ANALYSIS.

Susan P. Proctor, DSc[1,2,3]; Erik Rosenman, BA [1,2]; Tim Heeren, PhD [1,2]; Jessica Wolfe, PhD, MPH [3,4,] Boston University[1];Boston Environmental Hazards Center[2],National Center for PTSD[3], Psychology Service, VA Boston Healthcare System[4]

Introduction: Factors that affect attrition and retention are of great concern to the US military (GAO, 1997). Several studies have described that preparation for deployment and readiness for combat, as well as the conflicting demands of civilian job, family life, and training (Grissmer and Nataraj-Kirby, 1985; Griffith, 1995) are important issues affecting attrition in Reserve members.

Hypothesis: Through descriptive analyses of data collected prospectively from a group of GW veterans (Devens cohort), we explored the relationship between GW-deployment characteristics (e.g., officer status, unit cohesion, combat exposure) and retention in the Army National Guard (ARNG) approximately six years post-GW service. We hypothesized that the relationship between GW deployment factors and ARNG retention would be confounded or modified by physical functioning levels.

Procedures: The Devens cohort is a group of 2,949 US Army personnel deployed to the GW that returned from the GW through Ft. Devens, MA in 1991. The whole cohort has been surveyed at three time points (Spring 1991; 1993; 1997). For these descriptive analyses we focused on a subset of the cohort: those in the ARNG during the GW and who completed all three surveys (n=684). We compared two groups (those remaining in the ARNG v. those who were civilians six years after GW service) on a number of characteristics: demographics, GW characteristics, physical and emotional health, work characteristics, and family stress and strain indices. Logistic regression models were performed to examine the specific role of certain GW factors on ARNG retention 6 years after GW service and the additional impact that physical functioning (as measured by the SF36) might play in the former relationship.

Summary of Results: Of the 648 ARNG members, 120 (19%) had left the service by 1993 and 284 (44%) had left and were civilians six years later. Compared to the civilians, those individuals remaining in the ARNG six years after deployment were more likely to have had less education and have been older, married, and an officer at the time of their GW deployment. Also, they reported more leadership support within their GW unit compared to those who were civilians six year after the GW. Physical functioning levels six years post-GW service modified, but did not confound, the relationship between certain GW-deployment factors and ARNG retention.

Conclusions: The results suggest that certain GW deployment factors may play a role in ARNG retention and that these factors play a more important role in ARNG retention following the GW in those persons with higher levels of physical functioning.

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Presented at the Fifth Interdisciplinary Conference on Occupational Stress and Health conference-"Work, Stress and Health: New Challenges in a Changing Workplace" in Toronto, Ontario, Canada; March 21, 2003.

CIVILIAN JOB STRAIN AND PERFORMANCE
IN ARMY NATIONAL GUARD MEMBERS

Erik S. Rosenman, B.A.*, Kathryn E. Dutille, B.S., Lewis Pepper, M.D.,
Boston University School of Public Health (BUSPH), Susan P. Proctor, D.Sc.,
BUSPH and VA Boston Healthcare System

Using data from a cross-sectional survey study of current and former members of the Massachusetts Army National Guard (MA ARNG) conducted in 2001-2002, we examined the relationship between civilian job strain and civilian job performance and determined whether National Guard-related job strain acts as either a confounder or an effect modifier of that relationship. While 1,971 subjects completed the survey, 860 were included in the following analyses as they were currently in the ARNG and also currently working a civilian job. Civilian and ARNG job strain scores were calculated using answers from a subset of questions on the Karasek Job Content Questionnaire (JCQ). To assess civilian job performance problems, each respondent was asked how many times in the past year they had missed work, done poor quality work, arrived late or left early, did less work than usual, had an argument with a co-worker, or got injured on the job. A summary score for job performance problems was then calculated by summing the individual scores [mean (SD): 5.44 (5.3 1), range: 0-36]. Increasing civilian job strain was positively and significantly correlated with all job performance problem items as well as the overall job performance problem summary score (r=0.089-0.21 1). Increasing ARNG job strain showed a positive, significant correlation with increasing civilian job strain, and increasing civilian job performance problems (r=0. 1 86,0. 128 respectively). In multivariate linear regression analyses, civilian job strain was significantly associated with increased job performance problems [regression coefficient =2.436 (SE=0.65 1), p<O.OO1], after adjusting for age, gender, education, marital status, rank, and civilian job satisfaction. The inclusion of ARNG job strain in the model did not produce significant changes in the results (i.e. does not confound). ARNG job strain does appear to act as an effect modifier. When civilian job strain is low, moving from a low to high ARNG strain job produces a subtle change in the civilian job performance problem score. However, when civilian job strain is medium or high, moving from a low to high ARNG strain job is associated with an increase in civilian job performance problem scores (0.29 and 1.09, respectively). This effect modification will be taken into account in future analyses.

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DEPLOYMENT-RELATED JOB STRAIN AND HEALTH
AMONG ARMY NATIONAL GUARD MEMBERS

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University School of Public Health (BUSPH), Susan P. Proctor, DSc., BUSPH and VA
Boston Health Care System

A group of Massachusetts Army National Guard (ARNG) soldiers has been studied prospectively over the course of their scheduled peacekeeping mission to Bosnia in 2001-2002, along with a comparison group of non-deployed ARNG members. One specific aim of this study is to evaluate the role of deployment-related experiences (e.g., job strain) on changes in physical health and fatigue-related cognitive functioning (e.g. attention and concentration) over a deployment mission. A total of 77/93 deployed subjects (83%) completed the questionnaire portion of the protocol at both the pre- and post-deployment time point. The questionnaire included the SF12V and the MOS Cognitive Functioning Scale at each time point. ARNG job strain was assessed through the core 14-item Karasek Job Content scale. For this presentation, we focus on questionnaire responses from the deployed group concerning two outcomes of interest (physical health and cognitive functioning). The mean age of this deployed ARNG group of 77 soldiers is 28.2 years (range: 19-5 1). Approximately 88% are White, 55% are enlisted soldiers, 20% are married, 83% have some schooling beyond high school, and they are all males. Soldiers' physical functioning improved between the pre- and post-deployment assessments (pre-deployment=54.4 (4.6), post-deployment=55.5 (3.4); paired t-test= -2.1, p=O.O4). Soldiers' cognitive functioning (CF) was worse over this time period (pre-deployment=87.3 (1 1 . 1), post-deployment=83.6 (1 6.7); paired t-test=l .9, p=O.O6). Through hierarchical regression analyses that controlled for age, education level, rank, and pre-deployment functioning, deployment-related job strain changes were not found to be significantly associated with post-deployment physical health functioning. Increased job strain over deployment was significantly associated with worse post-deployment CF (regression coefficient=-18.1 (SE=5.5), p=O.OO2). No significant group level differences in job strain or unit cohesion between three deployed units were noted. Reported improvements in physical functioning over a deployment period are not associated with deployment-related job strain in this cohort of ARNG soldiers. However, results suggest that the cognitive functioning changes over a deployment period are related to changes in job strain factors. Modeling of computer-assisted cognitive test performance over time in relationship to changes in job strain among both the deployed and non-deployed groups is planned, along with further assessment of unit-level factors (such as unit cohesion and peacekeeping experiences).

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Presented (by LTC Hover) at the 6th Annual Force Health Protection Conference, Albuquerque, New Mexico August 12, 2003.

DEPLOYMENT HEALTH RESEARCH STUDY: COMPUTER-ASSISTED ASSESSMENT OF COGNITIVE PERFORMANCE AMONG ARMY NATIONAL GUARD MEMBERS

Susan P. Proctor D.Sc.[1,2], Kathryn E. Dutille B.S.[1], Erik S. Rosenman B.A.[1], COL Abraham Zimelman [2,3], MAJ James Ness[4], CDR Dennis Reeves[5], Timothy Elsmore Ph.D. [6]
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There have been few research studies that focus on prospective assessment of military personnel to examine health status changes over deployment and that include pre-deployment baseline measurements. This research study has two objectives: 1) to characterize and evaluate the functional health and cognitive abilities (such as attention and concentration) of the deployed group over time and in comparison to a group of non-deployed Army National Guard members, and 2) to conduct a feasibility and field validation study involving computer-assisted test batteries.

We will report on the progress in our on-going prospective field study involving a group of US Army National Guard members who deployed to Bosnia in 2001-2002 as part of SFOR 10 (n=93) and a comparison group of non-Bosnia-deployed ARNG soldiers (n=78). Pre-, during-, and post-deployment assessments have been completed within the deployed group and the initial baseline and follow-up assessments have been carried out with the non-deployed group (coinciding with the pre- and post-deployment time frame). The 1-year post-deployment follow-up assessment phase for both groups is planned for the spring of 2003. The study protocol includes a questionnaire and interview to assess functional health status, unit cohesion, fatigue and cognitive functioning symptomatology, ARNG job characteristics, and deployment preparedness. Cognitive performances have been measured at each timepoint using selected tests from the computer-assisted Neurobehavioral Evaluation System (NES3) battery, a validated neurobehavioral test battery developed for the epidemiological field study of the effects of environmental and occupational exposures. Additionally, subjects performed selected tests from the computer-assisted Automated Neuropsychological Assessment Metric (ANAM) battery and from the newly adapted version of several ANAM tests to a hand-held computer (PDA) platform called the ANAM Readiness Evaluation System (ARES).

The mean age of the study participants is 28 years, with 72% reporting some post-high school education, and 11% being officers. Results suggest that over the deployment period the physical health functioning levels of those who deployed to Bosnia significantly improved while there were no significant changes in physical functioning in the group of soldiers who did not deploy. Reports of fatigue and cognitive functioning difficulties increased between the pre- and post-deployment assessments in both groups, however, the differences were not significant over time within the non-deployed group. Within the deployed group over deployment, soldiers took significantly longer to respond to stimuli on the NES3 Continuous Performance Test (measure of sustained attention) with fewer errors, suggesting a strategic performance change.

In our presentation, we will summarize our findings relating to changes in functional health and cognitive functioning over deployment and discuss our experiences with the cognitive test batteries in these field settings.

OCCUPATIONAL HEALTH STUDY OF ARMY NATIONAL GUARD MEMBERS
SURVEY CONTENTS

SOURCE OF QUESTIONS/SCALES

Section A. General Information
[NOTES: questions include- today's date; dob; sex; race; highest grade(open); highest grade(category); repeat grade; marital status; spouse work outside home?; spouse hrs. of work; spouse ARNG member?; have children?; # children at home; income; health insurance?; family history ques.]

Section B. ARNG Job Information
[NOTES: questions include- currently in ARNG?; date left if not; /duration in ARNG, active duty service?, time in present unit?, military pay grade, & NG category, NCO? Are questions from Galioto, 1988; p. 98-99/; current MOS; current ARNG unit (write out)]

Section C. Civilian Job Information
[NOTES: questions include- current job title; category?; currently employed outside ARNG; in civilian job?; duration with current employer?; duration on job?; job situation; shift?; duration of that shift?; # hrs/week worked; OT hrs; mandatory OT?; eligible for OT pay?]

Section D. Other activities
[NOTES: questions include- 4 questions from NIOSH Job Stress Questionnaire about childcare responsibilities, elderly care responsibilities, etc.]

Section E. Medical Health
[NOTES: questions include- 1 question from CDC's Behavioral Risk Factor Surveillance System Questionnaire found at http://www.cdc.gov/nccdphp/brfss/about.htm ; list of medical conditions to endorse (or not)]

Section F. Health Status
[NOTES: questions include- 36 questions from SF36V (Ware 1993, 1994; Kazis et al. 1999); 4 q. from MOS cognitive functioning scale]

Section G. Physical Symptoms
[NOTES: questions include- 20 questions concerning fatigue symptomatology from the Checklist of individual strength (CIS; Beurskens et al., 2000)]

Section H. Characteristics of your ARNG Job
[NOTES: questions include- 31 questions from the Job Content Questionnaire (JCQ; Karasek et al., 1985: 6 q. on skill discretion (jcq #1,2,3,5,7,9); 3 q. on decision authority (#4,6,8); 9 q. on workload (#12,13,15,16,19,20,21,22,25); 5 q. on work demands (#14,17,18,23,24); 2 q. on job security (#27,28); 1 q. on skill utilization (#31); others;
1 q. on # days out of work (Polk et a; 1984);
6 q. on coping with ARNG work (NIOSH Job Stress Questionnaire);
for work performance on ARNG- 6 q. from Mangione et al. (1999) & 4 q. from MacEwen & Barling (1994); 4 additional questions from Lew Pepper's DoE Downsizing study]

Section I. ARNG Workplace Exposures
[NOTES: questions include- 3 workplace exposure q. from JCQ; 5 q. from Proctor et al. occupational exposure studies]

Section J. Relationships with Family and Friends
[NOTES: questions include- 10 q. on Family Strains, McCubben et al., 1996; 10 q. from Family Support Inventory for Workers (FSI-W; King et al., 1995, 2000); 1 q. on deployment issues; 1 q. about recommending ARNG job service]

Section K. Civilian Job Characteristics

[NOTES: questions include- 32 Ques. from JCQ: 6 q. on skill discretion (jcq #1,2,3,5,7,9); 3 q. on decision authority (#4,6,8); 9 q. on workload (#12,13,15,16,19,20,21,22,25); 5 q. on demands (#14,17,18,23,24); 3 job security (26,27,28); 1 skill utilization #32; others
days out (Polk et al.; 1984);
6 q. coping with job (NIOSH survey);
for work performance on civilian job- 6 q. from Mangione et al. (1999) & 4 q. from MacEwen & Barling (1994);
10 q. from FSI-W (Kings et al., 1995, 2000)]

Section L. Civilian Job Workplace Exposures

[NOTES: questions include- 3 workplace exposure q. from JCQ; 5 q. from Proctor et al. occupational exposure studies]

Section M. Health Symptoms

[NOTES: questions include- 25 q. from Gulf War study, Proctor et al., 1998]

Section N. General Lifestyle Questions

[NOTES: questions include- 3 q. on EtOH use & CAGE (Ewing et al., 1984 + modified version in Fertig et al., 1993); 4 q. on smoking]

Section O. Support

[NOTES: questions include- 20 q. from NIOSH Job Stress Questionnaire (from Caplan 1975); adapted to include ARNG supervisor and unit members]

Section P. Current Mood

[NOTES: questions include- 19 q. from BSI (Derogatis, 1993); 17 q. from PTSD Checklist (PCL; Weathers et al., 1993)

Section Q. Personal Characteristics

[NOTES: questions include- 27 q. from Eysenck. 1968; Floderus 1974; 6 q. Life Events (adapted from Norris et al., 1990)]

Section R. ARNG Service-Checklist

Reasons for joining:
Education benefits
Job-skills training
Military training opportunities
Military values and lifestyle
Opportunity for deployment missions
Pay and benefits
Service to country
Type of assignments

Reasons for staying/remaining:
Basic pay
Belonging to a team
Camaraderie, sense of esprit de corps
Education benefits
Enlistment promises met
Job security
Job-skills training
Military training opportunities
Military values and lifestyle
Opportunity for deployment missions
Responsive leadership
Retirement pay
Service to country
Type of assignments

Reasons for leaving:
Amount of personal or family time
Availability of needed equipment, parts, and materials
Civilian job concerns
Deployment missions
Emotional problems
Family concerns
Forced retirement
Lack of recognition
Leadership quality
Level of manning in your unit
Limited advancement opportunities
Medical or physical problems
Military values and lifestyle
Not promoted
Not treated fairly
Pay problems
Personal workload
Physical training
Type of assignments
Work not challenging